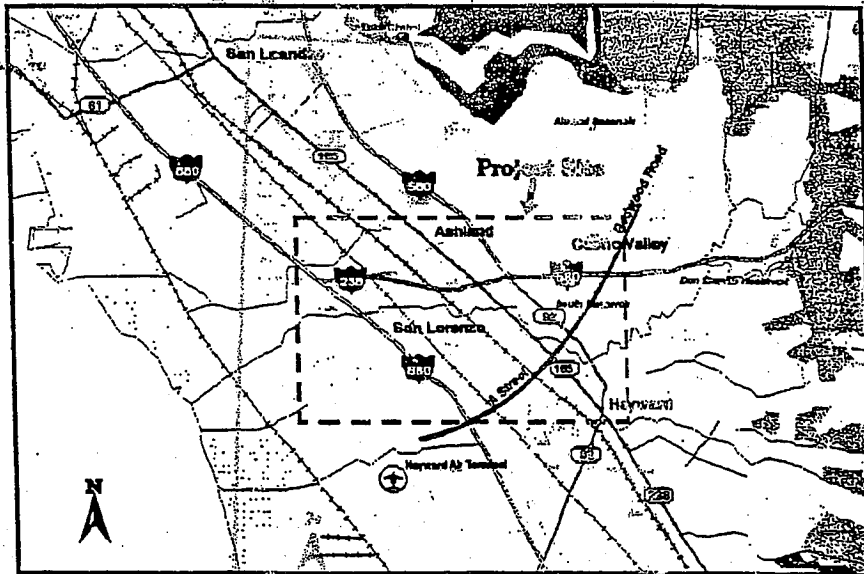


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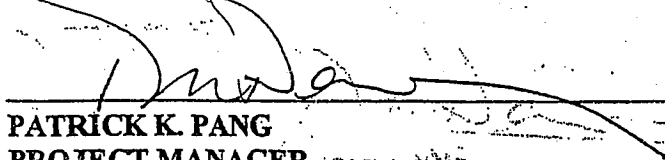


PROJECT STUDY REPORT



In Alameda County, in Hayward and San-Leandro, at
Castro Valley, Ashland, and San Lorenzo,
On Route 880 between A Street and Route 238;
On Route 238 between Route 880 and Route 580;
On Route 580 between 173rd Avenue and Redwood Road.

APPROVAL RECOMMENDED:


PATRICK K. PANG
PROJECT MANAGER

APPROVED:

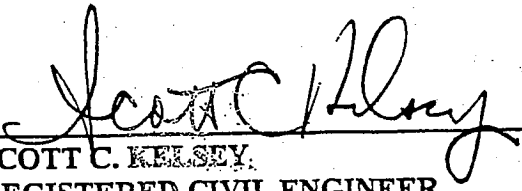

DIANNE STEINHAUSER
DISTRICT DIVISION CHIEF

DATE

11 Feb 98

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04-Ala-238-22.9/26.9 (KP)
04-Ala-580-R47.3/R50.5 (KP)
4257-24900K

This Project Study Report has been prepared under the direction of the following Registered Civil Engineer. The Registered Civil Engineer attests to the technical information contained the engineering data upon which recommendations, conclusions, and decisions are based.



SCOTT C. KELSEY
REGISTERED CIVIL ENGINEER

12/10/98
DATE

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I. INTRODUCTION

In order to improve capacity and enhance safety, this project proposes staged improvements of the Interstate 238 (I-238) freeway: the widening of I-238 from the present four lanes to six lanes, including improvements on several of the connectors to/from I-238; the addition of auxiliary lanes along Interstate 880 (I-880) south of I-238; and truck bypass lanes at the I-238 and Interstate 580 (I-580) Interchange. Reference is made to the location map (see Attachment 1). Due to funding limitations, this project can be broken down into three segments in the interim stage and one segment in the ultimate stage as described below.

◆ Interim Stage

- Segment 1. This segment includes widening improvements along northbound (NB) I-238 and along southbound (SB) I-880, south of I-238 (see Figure 1). This segment will cost approximate \$36,900,000.
- Segment 2. This segment includes widening improvements along SB I-238 beginning from the NB 880/SB 238 connector and continuing to I-580 and along NB I-880, south of I-238 (see Figure 2). This segment will cost approximate \$66,900,000.
- Segment 3. This segment includes reconstructing the Clark Avenue Overhead (OH) and Hesperian Boulevard Undercrossing (UC) bridges on NB of I-238. The existing pavement in this area will also be replaced based on the revised profile (see Figure 3). This segment will cost approximate \$7,700,000.

◆ Ultimate Stage

- This segment includes the addition of dedicated truck bypass lanes from SB I-238 to eastbound (EB) I-580 and from westbound (WB) I-580 to NB I-238. This would improve container truck access to the Port of Oakland and vehicle and goods access to the Oakland International Airport (see Figure 4). This segment will cost approximate \$106,800,000.

It is anticipated that Segment 1 of the interim stage will be funded by the 1998 State Transportation Improvement Programs (STIP). Segment 2 of the interim stage is recommended to be an element of the Alameda County Measure B Reauthorization Initiative (a one-half percent sales tax) which is scheduled to go before the voters in 1998. However, funding for Segment 3 and the ultimate stage is yet to be determined. Due to the uncertainty of the Alameda County Measure B Reauthorization Initiative, some funding adjustments may be necessary. For instance, the design of Segments 1 & 2 of the interim stage (STIP and Measure B) could be funded completely by STIP funds.

This project study report (PSR) is requested by the Alameda County Congestion Management Agency (CMA). The study area is in Alameda County, in Hayward and San Leandro, at Castro Valley, Ashland, and San Lorenzo, and is bound on I-880 between A Street and Route 238, on I-238 between Route 880 to Route 580, and on I-580 between 173rd Avenue and Redwood Road.

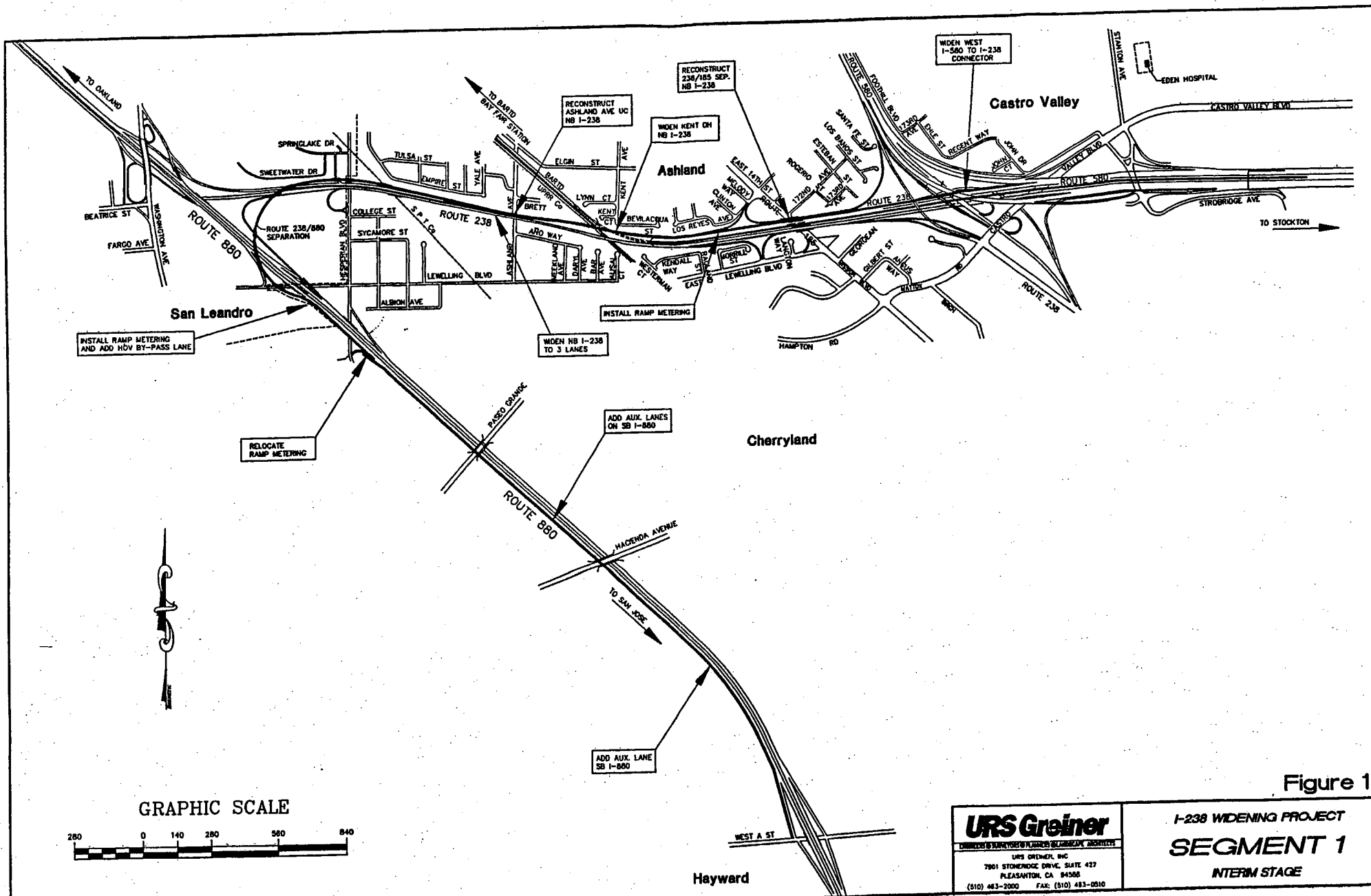
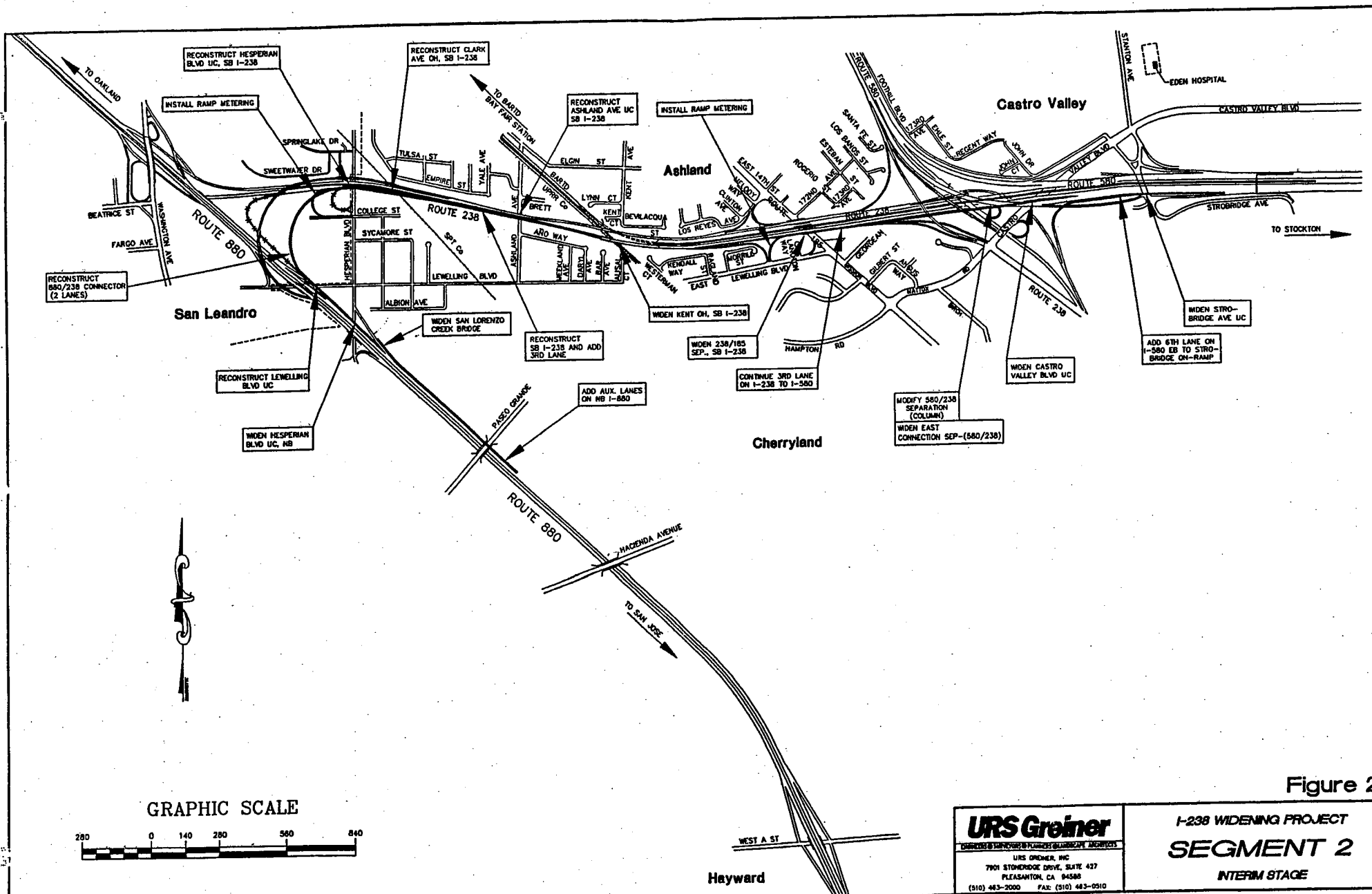
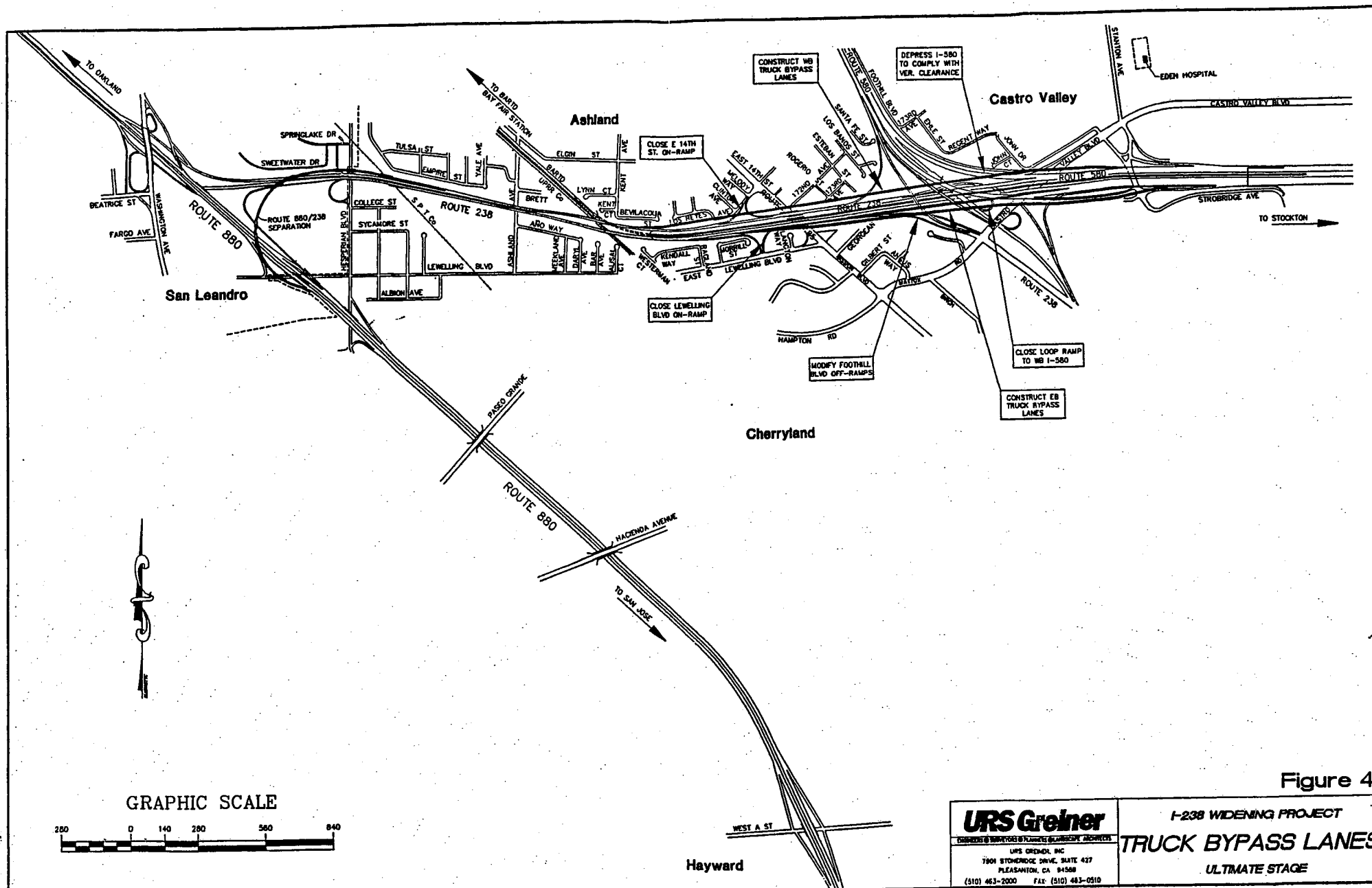


Figure 1





GRAPHIC SCALE

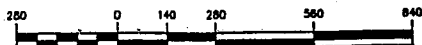


Figure 4

URS Greiner

ENGINEERING & CONSTRUCTION PLANNING & ARCHITECTURE

URS GREINER, INC.

7901 STONERIDGE DRIVE, SUITE 427

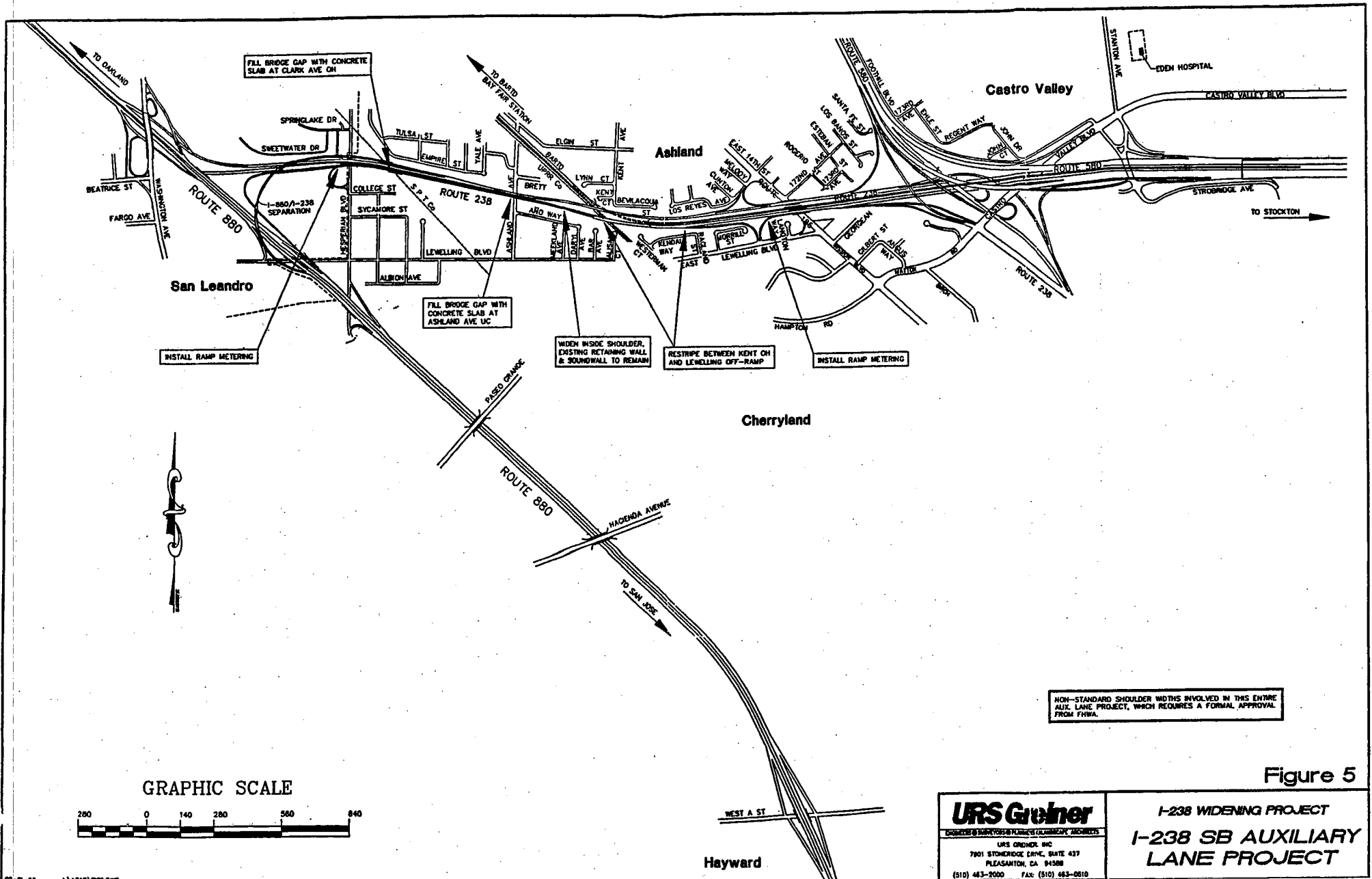
PLEASANTON, CA 94588

(510) 463-2000 FAX (510) 463-0510

I-238 WIDENING PROJECT

TRUCK BYPASS LANES

ULTIMATE STAGE



II. BACKGROUND

Interstate 238 serves as an important commercial and commuter connector, linking both I-880 and I-580. The route also serves as access to the San Mateo-Hayward Bridge from the I-580 corridor via Route I-880. The project limits are within the Cities of Hayward and San Leandro, and within the unincorporated areas of Castro Valley, Ashland, and San Lorenzo.

The existing I-238 freeway was constructed in the late 1950's and consists of four basic lanes between the I-580 and I-880 freeways. In addition, there are presently auxiliary lanes on I-238 between I-580 and the East 14th Street/Mission Boulevard Interchange. The I-238 SB Auxiliary Lane Project (see Figure 5) that is currently under design, will add an auxiliary lane on I-238 southbound between I-880 and the Lewelling Boulevard off-ramp. The Bay Area Rapid Transit District (BARTD) occupies the existing median for more than half of the length of I-238. Union Pacific Railroad (formerly Southern Pacific Railroad) crosses I-238 at the Clark Avenue OH and Kent Avenue OH.

A portion of I-238 was recently reconstructed for the new BART Dublin-Pleasanton extension. In order to accommodate BART's aggressive schedule, a decision by Caltrans was made not to widen the I-238 freeway at that time. Caltrans hoped that Route 238 would be widened after the BARTD project. Unfortunately, the statewide Seismic Retrofit Program was mandated soon after the project had been phased which diverted much of the construction funds away from the STIP and into the retrofit program. Route 238 is, therefore, presently congested, exceeding its traffic capacity during peak periods. Northbound I-238 operates near capacity at a level of service (LOS) E during both peak hours. In the Southbound direction, I-238 operates at LOS D during the a.m. peak hour and LOS F in the p.m. peak hour. Also, considerable traffic growth is projected in the future due to planned regional growth and from increasing inter-regional traffic, further diminishing the traffic-handling abilities of this freeway facility.

The City of Hayward has previously passed Measure L which allows construction of the Foothill Freeway (Route 238 Hayward Bypass). The Foothill Freeway will run south from the I-580/I-238 Interchange to Mission Boulevard (Route 238) near Industrial Parkway. The first stage of the Foothill Freeway will construct a 4-lane expressway between Harder Road and the I-580/I-238 interchange. The second stage would extend this facility to Tennyson Road, while the third stage would extend it to Industrial Parkway. Ultimately, this four-lane expressway could be converted into a six-lane freeway. The I-238 Widening Project is independent of this Foothill Freeway Project.

An Oakland city ordinance prohibits use of I-580 between the San Leandro/Oakland city limits and Grand Avenue by vehicles exceeding four and one-half (4 ½) tons except for passenger buses. As a result of this ordinance, almost all I-580 truck traffic passes through the I-238/I-580 interchange and on to existing I-238.

III. NEED AND PURPOSE

A. Existing Traffic Conditions

Traffic Volumes

Existing I-238 from I-880 to I-580 is a four-lane freeway with 3.6 m lanes, 3 m outside shoulders, and paved inside shoulders ranging 0.6 m to 3 m. The median width varies from 3.6 m to 18.3 m. This segment of I-238 runs from east-west but is designated as a north-south route with westbound traffic running north and eastbound traffic running south.

Existing traffic volumes on the mainline freeway and ramps are based primarily on traffic counts provided by the latest Caltrans estimates (see Figure 6). CCS Planning & Engineering, Inc. (CCS) conducted additional peak period counts on the four freeway-to-freeway ramps connecting I-238 with I-880 during August, 1997. These freeway-to-freeway ramp counts included vehicle classification counts to determine directional truck movements. The vehicle classification counts were combined with Caltrans truck volume data to provide the truck percentages for each freeway segment in the study area. (See Figure 7.)

Traffic counts at ramp and street intersections were compiled from a variety of sources, including Alameda County, the City of Hayward, and traffic counts conducted by Marks Traffic Data Services for this study in July, 1997.

Due to bottleneck locations and queues which restrict the throughput on certain sections of the freeway, the field traffic survey data may not reflect the actual demand, especially at the downstream of the traffic flow. Therefore, the unconstrained traffic demand was estimated by CCS. See Section 1 of *Traffic Operations Analysis Report* (Attachment 16) for details.

Levels of Service

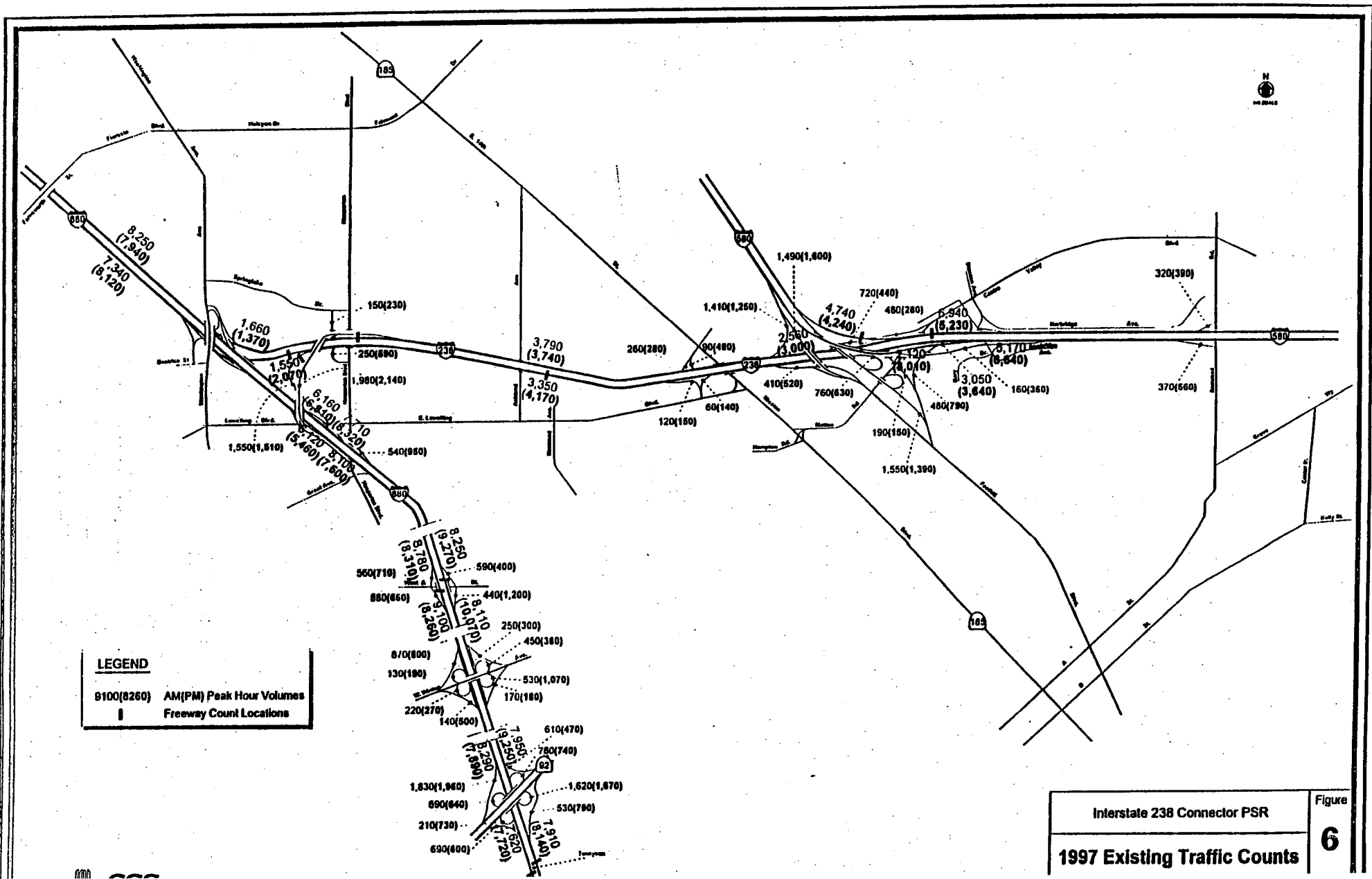
The peak hour traffic counts on each segment of the I-238, I-580 and I-880 freeways were compared to capacities using the procedures described in Chapter 3 of the 1994 *Highway Capacity Manual* (HCM). The results of this analysis are included in Figure 8. The analysis indicates that northbound I-238 operates near capacity at LOS E during both peak hours. In the southbound direction, I-238 operates at LOS D during the A.M. peak hour and LOS F in the P.M. peak hour.

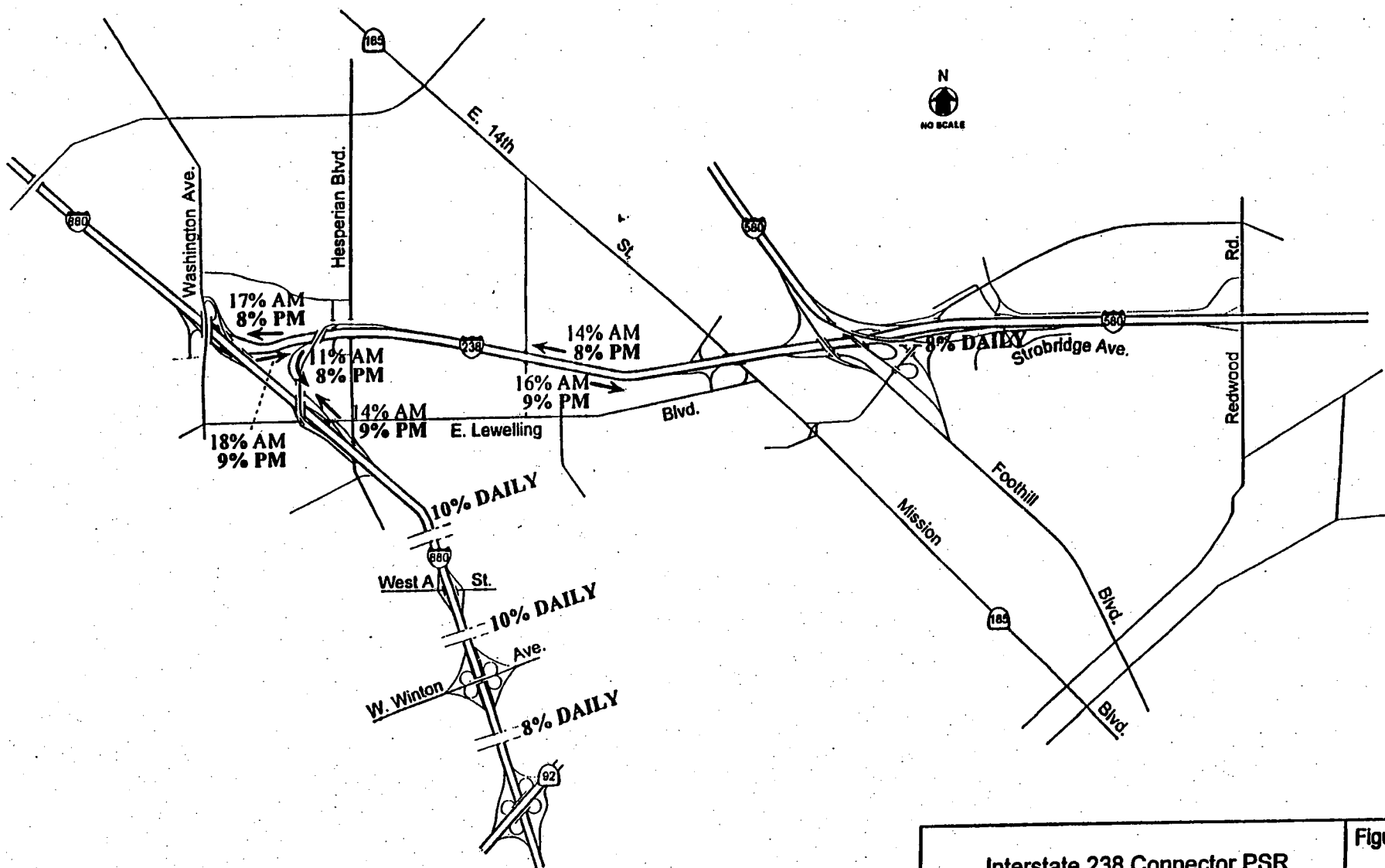
On southbound I-880, the analysis indicates LOS D to E during the A.M. peak hour, although observed conditions show that volumes may be constrained by congestion approaching the SR 92 interchange. The analysis indicates LOS D for northbound I-880 during the A.M. peak hour and LOS E to F during the P.M. peak hour, consistent with observed conditions.

Bottleneck Locations

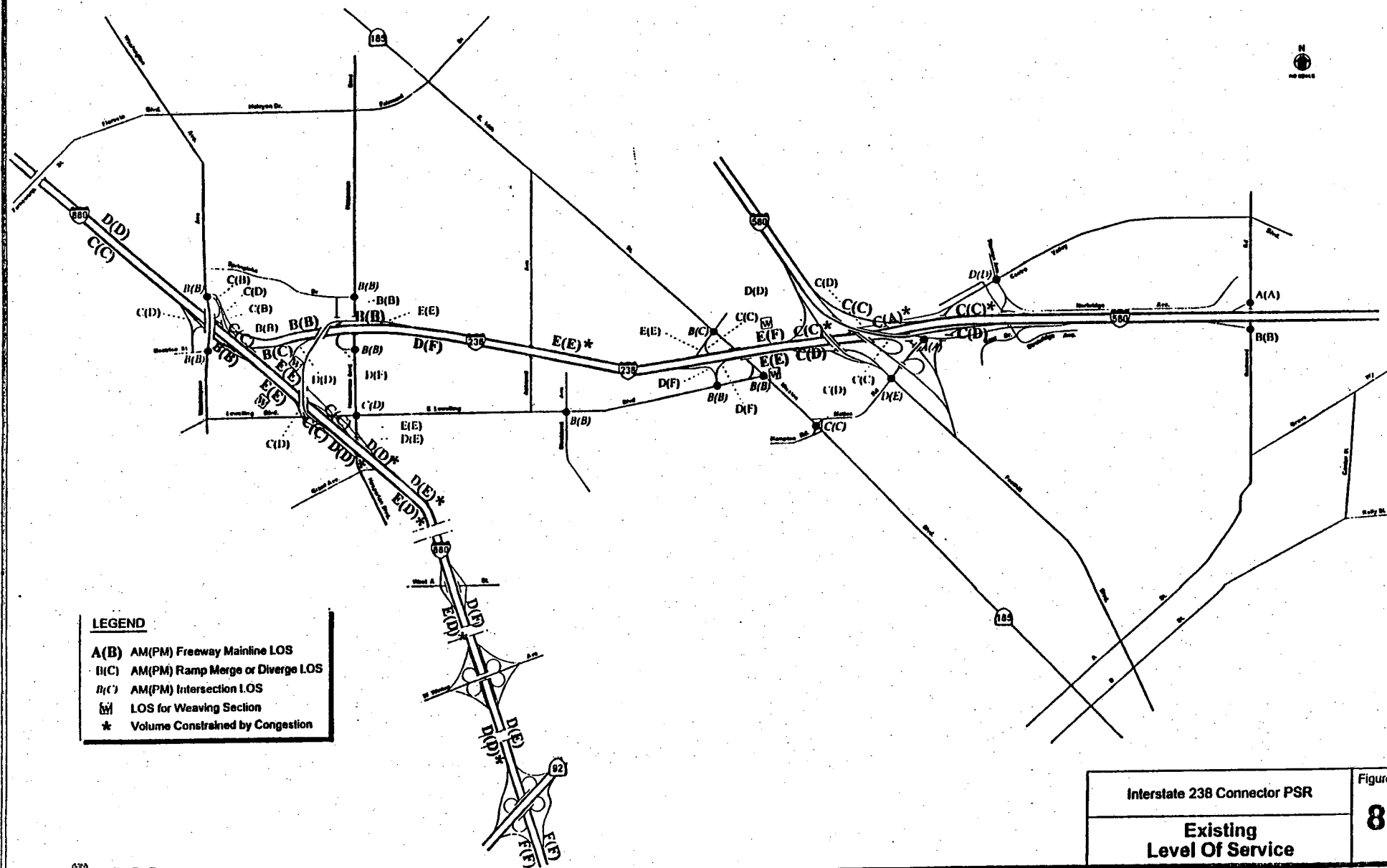
Since peak hour traffic counts do not always identify the most congested peak hour conditions, the estimated unconstrained traffic demands were compared to freeway capacities to determine critical bottleneck locations and queues. The analysis of unconstrained traffic demand indicated the following bottlenecks and queue locations (see Figure 9):

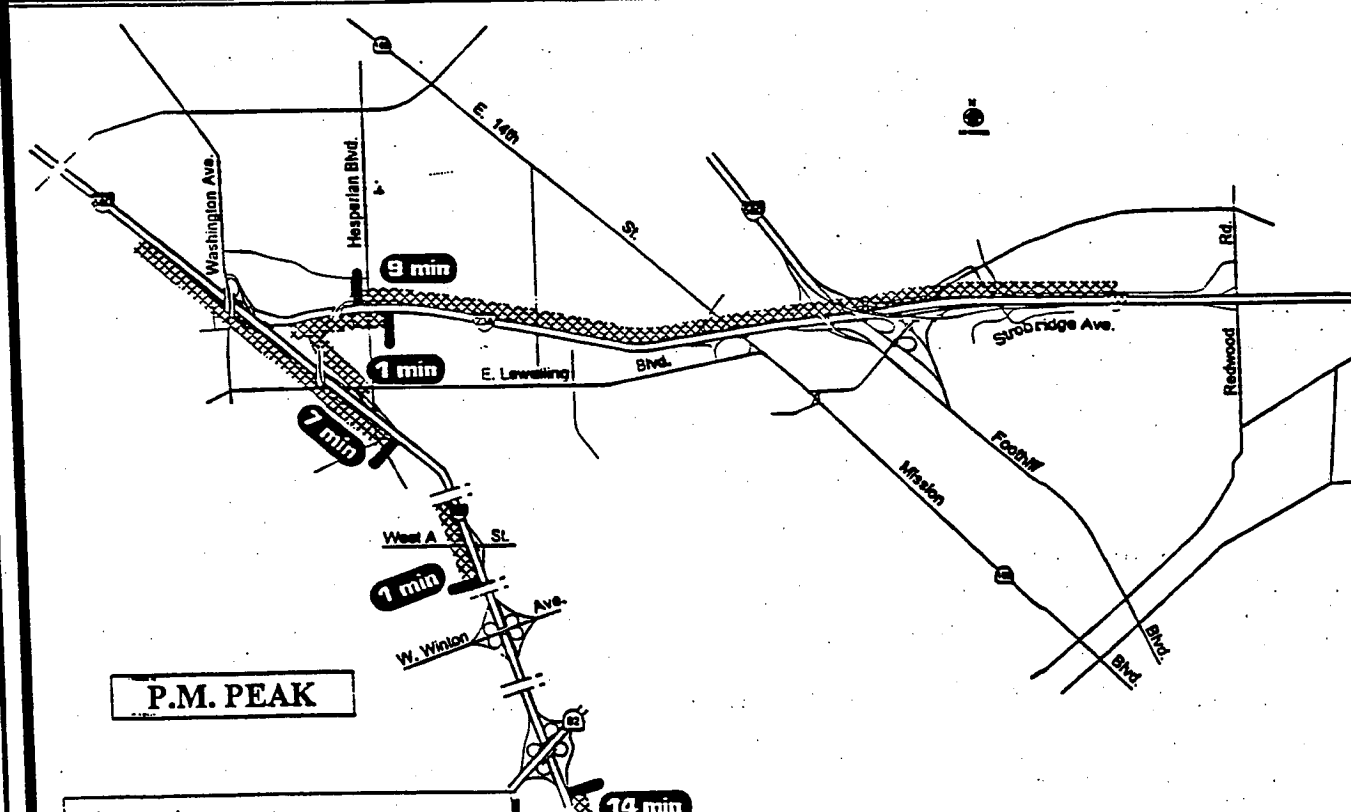
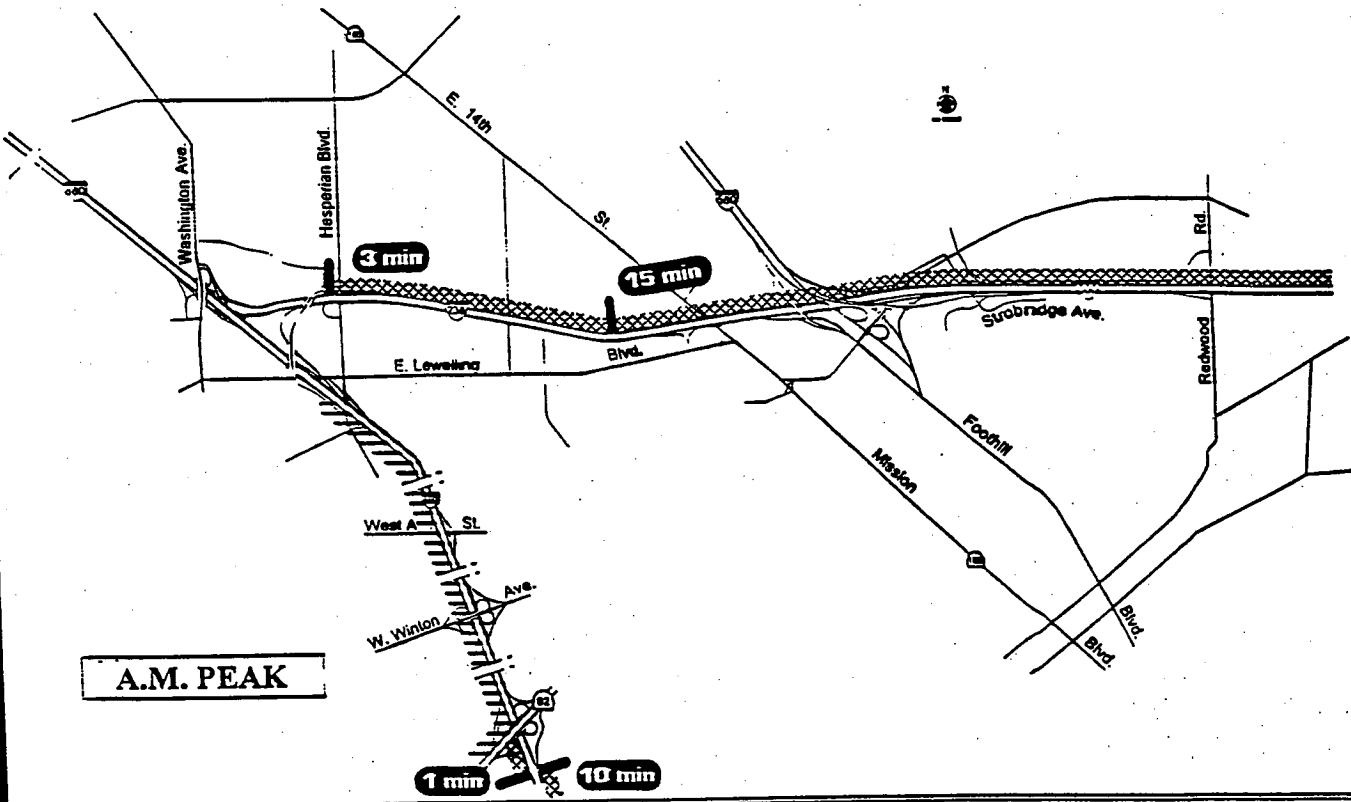
- A.M. peak, NB I-238 approaching I-238/I-880 connector (15 minute maximum delay)
- A.M. peak, on NB I-238 off-ramp to SB I-880 (3 minute maximum delay)
- A.M. peak, NB I-880 approaching SR 92 (10 minute maximum delay)





Interstate 238 Connector PSR	Figure 7
Truck Percentages	





Legend

- Bottleneck Location
- Calculated Peak Hour Queue
- Calculated Peak Hour Delay
- Other Observed Queues

Interstate 238 Connector PSR		Figure 9
Queue Locations 1997 Existing Conditions		

- P.M. peak, on NB I-238 off-ramp to SB I-880 (9 minute maximum delay)
- P.M. peak, SB I-880 approaching A Street (7 minute maximum delay)
- P.M. peak, SB I-880 approaching Winton Avenue (1 minute maximum delay)
- P.M. peak, NB I-880 approaching SR 92 (14 minute maximum delay)
- P.M. peak, SB I-238 at the end of the connector from NB I-880 to SB I-238 where traffic merges into two lanes (1 minute maximum delay)

Two additional queues were observed in the field that the analysis did not identify:

- A.M. peak, SB I-880 approaching the off-ramp to WB SR 92
- P.M. peak, NB I-880 approaching the off-ramp to SB I-238

It is believed that these queues are due primarily to merging problem at the end of freeway-to-freeway ramps. The overall traffic demands on the mainline freeway do not exceed the total available freeway capacities in these segments.

Weaving Operations

Within the study area, there is one segment in each direction on I-238 and one segment in each direction on I-880 which operate as weaving sections:

- Northbound I-238 from on-ramp from Eastbound I-580 to off-ramp to E. 14th Street
- Southbound I-238 from on-ramp from Lewelling Boulevard to off-ramp to Foothill Boulevard
- Northbound I-880 from on-ramp from Lewelling Boulevard to Washington Avenue
- Southbound I-880 from on-ramp from Washington Avenue to off-ramp to Lewelling Boulevard

The weaving section on northbound I-238 operates at LOS E during the A.M. peak hour and LOS F during the P.M. peak hour. All other weaving sections operate at LOS E during both peak hours.

Freeway Ramp Operations

Freeway ramp merge and diverge operations were analyzed and the results are shown in Figure 8. Level of service F conditions are indicated during the P.M. peak hour along southbound I-238 at the on-ramp from Hesperian Boulevard and the off and on-ramps at Lewelling Boulevard. These LOS F conditions are primarily due to high volumes on the mainline freeway rather than high ramp volumes. Level of service E operations occur during both the A.M. and P.M. peak hours for the on-ramp merge from East 14th Street to northbound I-238 and the flyover ramp diverge from northbound I-238 to southbound I-880.

Accident Data

Accident data for this project was obtained from Caltrans District 4 for the period from July 1, 1994 to June 30, 1997. Table 1 shows a tabulation of the number of accidents along with the actual and average rates at I-880, I-238, and I-580 freeways for the past three-year period. Table 1 also shows the total number of accidents at ramps for the same period. Figure 10 shows a graphical location of the accidents at those freeways and ramps.

A total of 645 accidents on northbound I-880 and 396 accidents on southbound I-880 was experienced in the past three years. The records show one fatality accident at Location 1 in the three-year period.

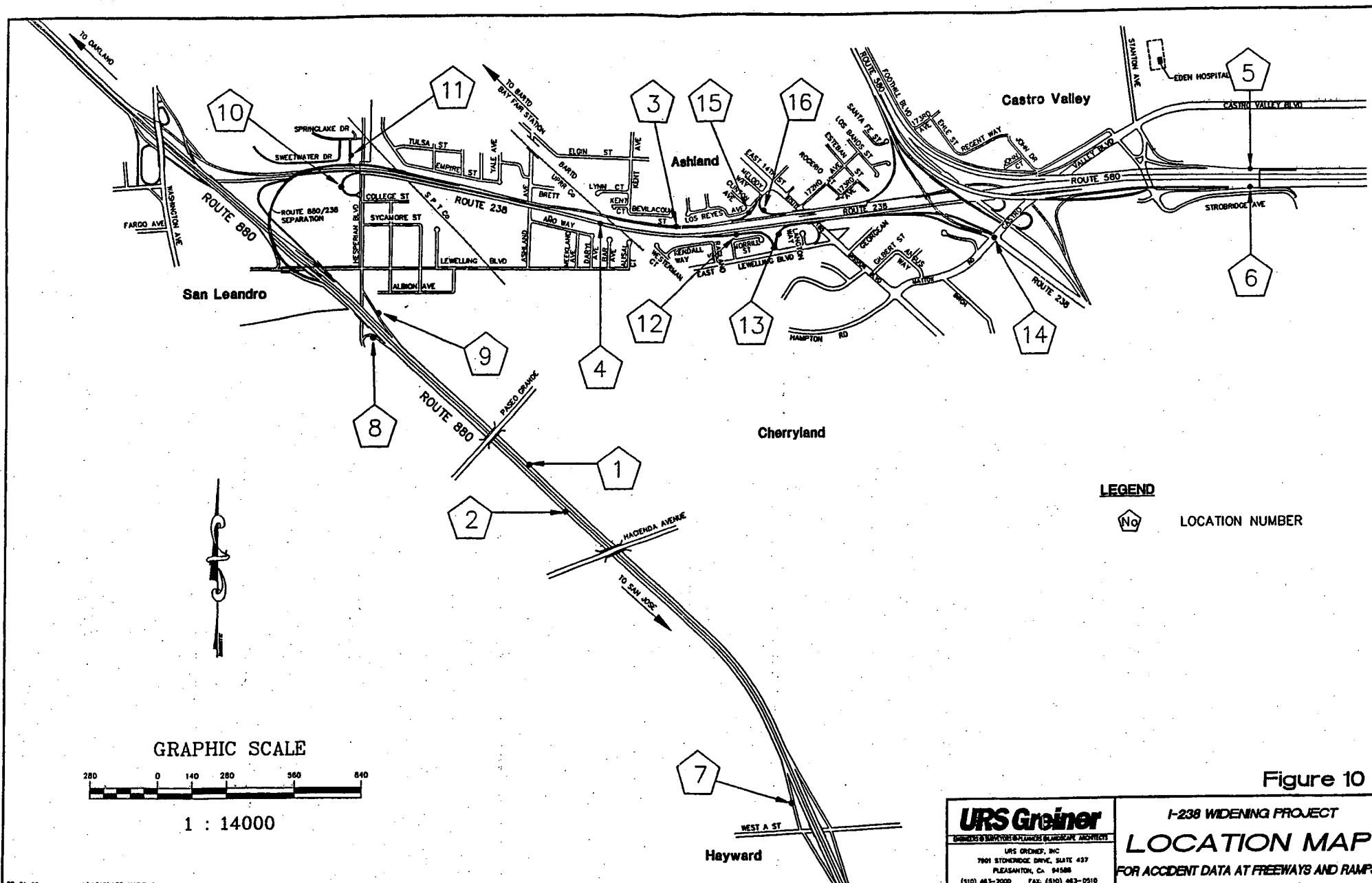


Table 1

**I-880, I-238, & I-580 Freeways and Ramps Accident Data/Rates
Three Year Totals (July 1, 1994 to June 30, 1997)**

No.	Location	No. of Accidents			Actual Rates			Average Rates		
		Fatal	Fatal + Injury	Total	Fatal MVM	Fatal + Injury MVM	Total MVM	Fatal MVM	Fatal + Injury MVM	Total MVM
1	880 NB PM 18.300 THRU 20.699	1	229	645	0.004	0.82	2.31	0.006	0.34	0.97
2	880 SB PM 18.300 THRU 20.699	0	142	396	0	0.51	1.42	0.006	0.34	0.97
3	238 NB PM 14.200 THRU 16.695	2	93	313	0.016	0.72	2.44	0.009	0.36	0.88
4	238 SB PM 14.200 THRU 16.695	0	57	169	0	0.44	1.32	0.009	0.36	0.88
5	580 WB PM 29.400 THRU 31.399	2	59	135	0.013	0.37	0.85	0.006	0.29	0.82
6	580 EB PM 29.400 THRU 31.399	0	26	57	0	0.16	0.36	0.006	0.29	0.82
7	A Street off-ramp, SB I-880 PM 18.482	0	3	9	0	0.28	0.84	0.005	0.59	1.50
8	Hesperian Blvd, on-ramp, SB I-880 PM 19.961	0	1	8	0	0.10	0.79	0.002	0.32	0.80
9	Hesperian Blvd, off-ramp, NB I-880 PM 20.011	0	8	40	0	0.76	3.79	0.005	0.59	1.50
10	Hesperian Blvd on-ramp, SB I-238 PM 16.321	0	2	6	0	0.37	1.12	0.003	0.35	0.90
11	Hesperian Blvd off-ramp, NB I-238 PM 16.301	0	2	5	0	0.61	1.52	0.004	0.41	1.20
12	Lewelling Blvd off-ramp, SB I-238 PM 15.091	0	5	13	0	1.45	3.77	0.004	0.41	1.20
13	Lewelling Blvd on-ramp, SB I-238 PM 15.001	0	4	6	0	1.03	1.54	0.002	0.19	0.60
14	Castro Valley Blvd/Foothill Blvd off-ramp, SB I-238 PM 14.250 - 14.338	0	13	30	0	0.26	0.59	0.004	0.18	0.39
15	E. 14th Street on-ramp, NB I-238 PM 15.171	0	1	4	0	0.22	0.89	0.004	0.21	0.55
16	E. 14th Street off-ramp, NB I-238 PM 15.011	0	2	7	0	0.48	1.68	0.006	0.34	0.90

Note: MVM=million vehicles-miles

A total of 313 accidents on northbound I-238 and 169 accidents on southbound I-238 was experienced in the past three years. The records show two fatality accidents at Location 3 in the three-year period. It should be noted that the overall actual rates were 50% or more higher than average rates along both I-880 and I-238.

The accident data also shows that 135 accidents on westbound I-580 and 57 accidents on eastbound I-580 occurred in the past three years. The records show two fatality accidents at Location 5 in the three-year period. Although the overall actual rates were close to or lower than average rates along this freeway, the actual fatality rates are much higher than the average rates.

It is anticipated that with this project the congestion in this area will be improved and the actual accident rate will decrease.

Traffic Forecast

The traffic forecasts pertaining to this area are based on the Planning Area 2 version of the Alameda County travel model, which is a sub-area model of the Alameda County Congestion Management Agency's county-wide model. A detailed discussion of model assumptions is described in the *Traffic Operations Analysis Report*, which was prepared for this PSR by CCS in December, 1997. Their findings under the No Project option are presented as follows.

I-238 Segment (between Hesperian Blvd. and Mission Blvd.)

Design year	1997	2005	2025
VPH peak-hour NB – AM	3790	5260	5460
VPH peak-hour NB – PM	3740	4080	4090
VPH peak-hour SB – AM	3350	3930	3870
VPH peak-hour SB – PM	4170	5690	5660

I-880 Segment (south of I-238/I-880 connector)

Design year	1997	2005	2025
VPH peak-hour NB – AM	7710	9250	9770
VPH peak-hour NB – PM	8320	10320	10190
VPH peak-hour SB – AM	8100	9750	9700
VPH peak-hour SB – PM	7600	10640	10320

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The 2005 and 2025 forecasted traffic data assumed the completion of the Hayward Bypass Project, which is a four-lane expressway from Industrial Parkway to I-580.

According to the above forecast, the existing four-lane I-238 facilities, currently operated at level of service E or below, are not adequate to accommodate future traffic demand.

B. Purpose of Proposal

The proposed I-238 widening and auxiliary lane on I-880 will provide additional capacity, and reduce the existing and projected traffic congestion and delays. This will also improve the traffic operation of Interstate 880-238-580 freeway corridor, particularly on arterial streets adjacent to the corridor such as Lewelling Boulevard and Mattox Road. Peak hour volumes would also be reduced on parallel streets such as A Street, Winton Avenue and Jackson Street. In addition, I-238 carries a significant volume of heavy truck traffic (8% to 10% of average daily traffic) and the proposed truck bypass lanes will improve safety and reduce weaving caused by truck speed reduction.

IV. ALTERNATIVES

This PSR focuses on providing interim improvements to the existing highway facilities to meet the year 2005 traffic demands. The ultimate improvement, i.e. Truck Bypass Lane Project, has been briefly discussed at the end of this section. A Value Analysis should be performed during the Project Report process.

Due to dense developments and other constraints along the existing facility, two main alternatives are being considered in this report.

1. Alternative A

Alternative A is the "No-Build" solution. This alternative would leave the exist Route 238 as is. Existing truck traffic will continue to be constrained within the through lanes for mixed-flow traffic. Traffic forecasts indicate that traffic volumes will increase and Level of Service (LOS) will decrease. This will contribute to an increase in the rate of accidents.

2. Alternative B

This alternative consists of four parts: Segments 1, 2, & 3 of the interim project, and the Truck Bypass Lanes of the ultimate project. Attachments 2, 4, 5, 6, & 7 illustrate the plan view of the interim project and the associated profiles. Attachments 8 & 9 illustrate the plan view of Truck Bypass Lane project and the associated profiles. The proposed improvements to the study area are described as follows:

◆ Segment 1

- Widen northbound I-238 from 2 to 3 lanes. The improvement involves realignments of East 14th Street on- and off-ramps, the east (I-580)-to-north (I-238) connector, and the addition of an auxiliary lane between east (I-580)-to-north (I-238) connector and East 14th Street off-ramp.
- Widen Kent Avenue OH and reconstruct northbound 238/185 Separation and Ashland Avenue UC due to the non-standard vertical clearances under those bridges. This will require a profile realignment, together with reconstruction of the existing mainline facility.
- Install ramp metering equipment at the East 14th St on-ramp. Ramp metering is also being considered at the I-238/I-880 flyover connector.
- Add an auxiliary lane on southbound I-880 from north (I-238)-to-south (I-880) connector to the A Street off-ramp. This improvement includes the reconstruction of the Hesperian Boulevard on-ramp, including ramp metering relocation.

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Total Project Cost	
Construction Cost	
Roadway Items	<u>\$14,100,000</u>
Structure Items	<u>\$10,600,000</u>
Right-of-Way Items	<u>\$ 1,200,000</u>
Support Cost	
Engineering & Management	<u>\$ 8,400,000</u>
Project Reserve (7.5%)	<u>\$ 2,600,000</u>
Total Project Cost	<u>\$36,900,000</u>

In order to minimize the impacts to adjacent properties along I-880, non-standard 2.4 m inside median shoulders are proposed between the I-880/I-238 connector and A Street (see Attachment 2). In addition, the lane width would be reduced to 3.3 m for the three most-left (inside) lanes on SB I-880. With this exception to the design standards, the existing sound wall could remain in place, and minimal right-of-way acquisition would be needed. Please note that the existing median shoulders, which vary from 1.5 m to 3 m, are non-standard shoulders.

An alternative, which will maintain the existing median shoulders and lane widths along I-880, was studied and presented to Caltrans during this PSR process. But it requires significant right-of-way acquisition and reconstruction of the existing sound walls. This alternative was eliminated due to the additional construction cost and impact on residential properties.

The mandatory design exceptions for the non-standard shoulder width and lane width have been reviewed and concurred by John Roccanova, Geometric Reviewer, and Mike Thomas, Project Development Coordinator for Design and Local Programs. (See draft Mandatory Design Exception Fact Sheet, Attachment 3.) Approval of these Mandatory Design Exceptions will be obtained in the near future.

There are no known major drainage or utility facilities required for, or impacted with this segment. Right-of-Way requirements involve a total of six parcels (see Attachment 15).

◆ Segment 2

- Add an auxiliary lane on northbound I-880 from Hacienda Avenue to north (I-880)-to-south (I-238) connector. The improvement includes realignment of the Hesperian Blvd off-ramp, and widening of the Hesperian Blvd UC and San Lorenzo Creek Bridge as needed.
- Reconstruct the north (I-880)-to-south (I-238) connector to a two-lane connector, including 2-lane Lewelling Blvd UC.

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 4257-24900K

- Extend College Street to the Caltrans proposed maintenance area within the I-880/238 Interchange and relocate the Hesperian Boulevard on-ramp.
- Widen southbound I-238 from 2 to 3 lanes and reconstruct the freeway from Hesperian Blvd UC to Kent Ave OH on a new vertical alignment. The improvement includes the relocations of ramp metering at the Hesperian Blvd and Lewelling Blvd on-ramps, which is proposed with the I-238 SB Aux. Lane Project (EA 242301). The improvement also includes the addition of an auxiliary lane between the Lewelling Blvd on-ramp and Foothill Blvd off-ramp.
- Reconstruct Hesperian Blvd UC, Clark Avenue OH and Ashland Avenue UC to the new profile and to comply with the standard vertical clearance.

Right-of-Way Acquisition (see Attachment 15)

(1) Right-of-way acquisition at the Hesperian Blvd. off-ramp from NB I-880 would be required. The partial take of five residential parcels would very likely be required.

(2) One parcel, adjacent to the Lewelling Boulevard on-ramp to SB I-238, and two parcels, adjacent to the Kent Avenue Overhead, would require acquisition.

(3) Right-of-Way acquisition at Hesperian Boulevard and College Street for the extension of College Street would be required. A partial take of Baker's Square Restaurant parking lot would be required.

	Total Project Cost
Construction Cost	
Roadway Items	<u>\$25,300,000</u>
Structure Items	<u>\$21,000,000</u>
Right-of-Way Items	<u>\$1,200,000</u>
Support Cost	
Engineering & Management	<u>\$14,700,000</u>
Project Reserve (7.5%)	<u>\$4,700,000</u>
Total Project Cost	<u>\$66,900,000</u>

There are three options that were explored in this study for extending the third lane to I-580. The geometric exhibits are shown in Attachments 4, 5, and 6 respectively, and are described as follows:

04-Ala-880-29.5/33.3 (KP)
 04-Ala-238-22.9/26.9 (KP)
 04-Ala-580-R47.3/R50.5 (KP)
 4257-24900K

a. Option A - Attached lane

This option will require the modification of two existing bents near 580/238 East Connector Separation, so that the full lane and shoulder width can be provided. This option costs approximate 10.1 million dollars, and is included in the Total Project Cost for this Segment 2.

b. Option B - Mini Truck Bypass Lane

To avoid the reconstruction of several of the existing columns, the third lane to I-580 would be detached from the existing two lanes. With this option the detached lane would become a required truck lane. This option costs approximate 3.6 million dollars. If Option B was selected, a cost savings of 6.5 million dollars would be realized from the Segment 2 Total Project Cost.

c. Option C - With Non-Standard Shoulder Width

This option would add a third lane to I-580 and preserve existing columns, by using non-standard shoulder widths. This option costs approximate 2.5 million dollars. If Option C was selected, a cost savings of 7.6 million dollars would be realized from the Segment 2 Total Project Cost.

Due to its conventional nature and utilization of standard shoulder widths, Option A is the preferred alternative, although it is the most costly option.

There are no known major drainage or utility facilities required for, or impacted with this segment.

◆ **Segment 3**

- Reconstruct Clark Avenue OH and Hesperian Boulevard UC on northbound I-238 due to the age of these structures and non-standard vertical clearance. The existing pavement in this area will also be replaced based on the revised profile. The existing count station at NB I-238/Hesperian Blvd off-ramp will need to be replaced.

	Total Project Cost
Construction Cost	
Roadway Items	<u>\$2,200,000</u>
Structure Items	<u>\$3,100,000</u>
Right-of-Way Items	<u>\$0</u>
Support Cost	
Engineering & Management	<u>\$1,800,000</u>
Project Reserve (7.5%)	<u>\$ 500,000</u>
Total Project Cost	<u>\$7,600,000</u>

There are no known major drainage or utility facilities required for, or impacted with this segment.
 There are no impacts to right-of-way.

04-Ala-880-29.5/33.3 (KP)
 04-Ala-238-22.9/26.9 (KP)
 04-Ala-580-R47.3/R50.5 (KP)
 4257-24900K

◆ Truck Bypass Lane Project

- This improvement includes the addition of dedicated truck bypass lanes from southbound I-238 to eastbound I-580 and from westbound I-580 to northbound I-238. There are several alternatives that were investigated to implement this project. One of them is to build a diamond interchange at the I-238/Mission Blvd intersection to provide accesses in all directions. With this option, a tunnel structure would be required at the off-ramp to Mission Blvd, NB I-238. Due to its high cost, this alternative was eliminated in the early stage of this study.

The alternative presented in Attachment 8 was deemed most cost-effective. On SB I-238, the Lewelling Blvd on-ramp and the loop-ramp to WB I-580 will be removed. The off-ramps to Foothill Blvd/Castro Valley Blvd will be modified to accommodate a new connector to Hayward Bypass Freeway. At the location where the truck bypass lane crosses over Strobridge Avenue, sufficient vertical clearance over the EB I-580 off-ramp to Strobridge Avenue would not be obtained using the standard box girder structure. To solve this potential problem, a special structure design to reduce the depth of the superstructure for the Strobridge Avenue UC would be required. Another solution would involve the realignment of this EB I-580 ramp, and requires additional right-of-way take, however this option was not explored any further. On NB I-238, the East 14th Street on-ramp would be removed. The portions of WB I-580 freeway and Foothill Blvd would be depressed to comply with the vertical clearance standards.

	Total Project Cost
Construction Cost	
Roadway Items	<u>\$44,900,000</u>
Structure Items	<u>\$25,700,000</u>
Right-of-Way Items	<u>\$ 2,500,000</u>
Support Cost	
Engineering & Management	<u>\$24,000,000</u>
Project Reserve (10%)	<u>\$ 9,700,000</u>
Total Project Cost	<u>\$106,800,000</u>

The proposed mandatory and advisory design exceptions required for the various options are summarized in the Tables 2 & 3 and their locations are shown in Figure 11.

There are no known major drainage or utility facilities required for, or impacted with this segment.

Analysis of Proposal

Existing peak hour traffic demands on I-238 are at or above the capacity of the freeway between I-580 and I-880. Queues occur on northbound I-238 approaching the connecting ramps to I-880, delaying passenger vehicles as well as goods movement between the Central Valley and important Bay Area shipping points. Limited capacity on southbound I-238, and on the connector ramp from northbound I-880, results in P.M. peak queues on northbound I-880, causing delays and safety concerns.

2005 Project Impacts The Project would increase A.M. peak hour throughput from northbound I-238 to southbound I-880 by 50 percent and to northbound I-880 by nearly 50 percent. Delays on southbound I-880 south of I-238 would be increased by about three minutes. These delays on the I-880 mainline could be reduced through use of ramp metering on the on-ramp from northbound I-238. The Project would increase P.M. peak hour throughput on southbound I-238 by 50 percent, with no projected increases in delay on I-880. These volume increases indicate a significant latent demand for travel on I-238, which can only be accommodated through the capacity increases proposed as part of this Project.

2025 Project Impacts The Project would increase throughput on northbound I-238 by 50 percent during the A.M. peak hour, and would reduce delays to less than half of the No Project condition (about 10 minutes per vehicle). Delays per vehicle on southbound I-880 would increase by two minutes. These delays on the I-880 mainline could be reduced through use of ramp metering on the

Note: See Key Map (Figure 11)

Table 2
MANDATORY DESIGN EXCEPTION REPORT

TYPE OF DESIGN EXCEPTION
a = Non-standard shoulder width
d = Non-standard deceleration length
f = Non-standard lane width

	Location	Non-Standard Feature	Standard for Which Exception Requested	Reasons for Which Exception Requested	Added Cost to Make Standard
a1	NB I-880, from Hacienda Ave. to 880/238 SE connector	2.4 m (8 ft) wide left shoulder is proposed, while existing left shoulder varies from 3 m to 1.5 m in this area.	Section 302.2 and Table 302.1 of the Highway Design Manual specifies that the left shoulder width shall be 3 m for 6 or more lanes freeway.	To avoid right-of-way acquisition and relocation of existing soundwall, left shoulders are reduced to 2.4 m.	The standard could be obtained for I 880 by relocating soundwall. It would cost approximately \$2,600,000 (total) to make this item standard. Additional R/W and pavement are required.
a2	SB I-880, from Hacienda Ave. to 880/238 SE connector	2.4 m (8 ft) wide left shoulder is proposed, while existing left shoulder varies from 3 m to 1.5 m in this area.	Section 302.2 and Table 302.1 of the Highway Design Manual specifies that the left shoulder width shall be 3 m for 6 or more lanes freeway.	To avoid right-of-way acquisition and relocation of existing soundwall, left shoulders are reduced to 2.4 m.	The standard could be obtained for I 880 by relocating soundwall. It would cost approximately \$2,400,000 (total) to make this item standard. Additional R/W and pavement are required.
a3	Hesperian Blvd. on-ramp (SB I-880)	0.6 m (2 ft) wide right shoulder is proposed. The existing ramp has a standard 8' right shoulder.	Section 302.2 and Table 302.1 of the Highway Design Manual specifies that the right shoulder width shall be 2.4 m for multilane ramps.	To reduce right-of-way acquisition, less soundwall relocation, and most importantly, to minimize the impact to the Lucky building, including truck circulation and access.	The standard could be obtained for this ramp by acquiring R/W and significantly modifying Lucky building. It would cost approximately \$1,400,000 (total) to make both these items std.
d1	E. 14th St. off-ramp (NB I-238)	Only 92 m deceleration length is provided, which is about the same as the existing.	Section 504.2 (2) of the Highway Design Manual specifies that the minimum deceleration length shall be 180 m beyond the exit nose when the first curve radii is less than 90 m.	Since this off-ramp is very close to the upstream 580/238 NE connector there is no space to develop a full deceleration length.	The standard could be obtained by realigning 3 ramps: E. 14th St off-ramp, 580/238 connector, and NB I-238 on-ramp in this area. It would cost approx. \$2,000,000 to make this item standard. The cost includes new pavement and a tunnel.
d2	Hesperian Blvd off-ramp (NB I-238)	Only 97 m deceleration length is provided. The existing off-ramp provides sufficient deceleration length, however with non-standard diverging angle at the exit.	Section 504.2 (2) of the Highway Design Manual specifies that the minimum deceleration length shall be 180 m beyond the exit nose when the first curve radii is less than 90 m.	Since this off-ramp is very close to the 238/880 connector flyover (side by side) and restricted by the existing columns, there is no space to develop a full deceleration length.	The standard could be obtained by modify one existing column. It would cost approx. \$1,000,000 to make this item standard.
f1	NB I-880, from Hacienda Ave. to 880/238 SE connector	3.3 m lane width is proposed for the two inside lanes on NB I-880. The existing lane width is 3.6 m (12 ft)	Section 301.1 of the Highway Design Manual specifies that the basic lane width for new construction on two lane and multilane highways shall be 3.6 m.	To avoid right-of-way acquisition and relocation of existing soundwall, the lane width of two inside lanes is reduced to 3..3 m.	See a1 for details.

Note: See Key Map (Figure 11)

Table 2
MANDATORY DESIGN EXCEPTION REPORT

TYPE OF DESIGN EXCEPTION
a = Non-standard shoulder width
d = Non-standard deceleration length
f = Non-standard lane width

Location		Non-Standard Feature	Standard for Which Exception Requested	Reasons for Which Exception Requested	Added Cost to Make Standard
a2	SB I-880, from Hacienda Ave. to 880/238 SE connector	3.3 m lane width is proposed for the three inside lanes on SB I-880. The existing lane width is 3.6 m (12 ft)	Section 301.1 of the Highway Design Manual specifies that the basic lane width for new construction on two lane and multilane highways shall be 3.6 m.	To avoid right-of-way acquisition and relocation of existing soundwall, the lane width of three inside lanes is reduced to 3.3 m.	See a2 for details.

Notes: 1. Sections and Tables mentioned in this report refer to the Caltrans Highway Design Manual, Metric Fifth Edition, 1995.
2. For purposes of this report, the terms "left" and "right" are in relation to the direction of travel.

Note: See Key Map (Figure 11)

Table 3

TYPE OF DESIGN EXCEPTION

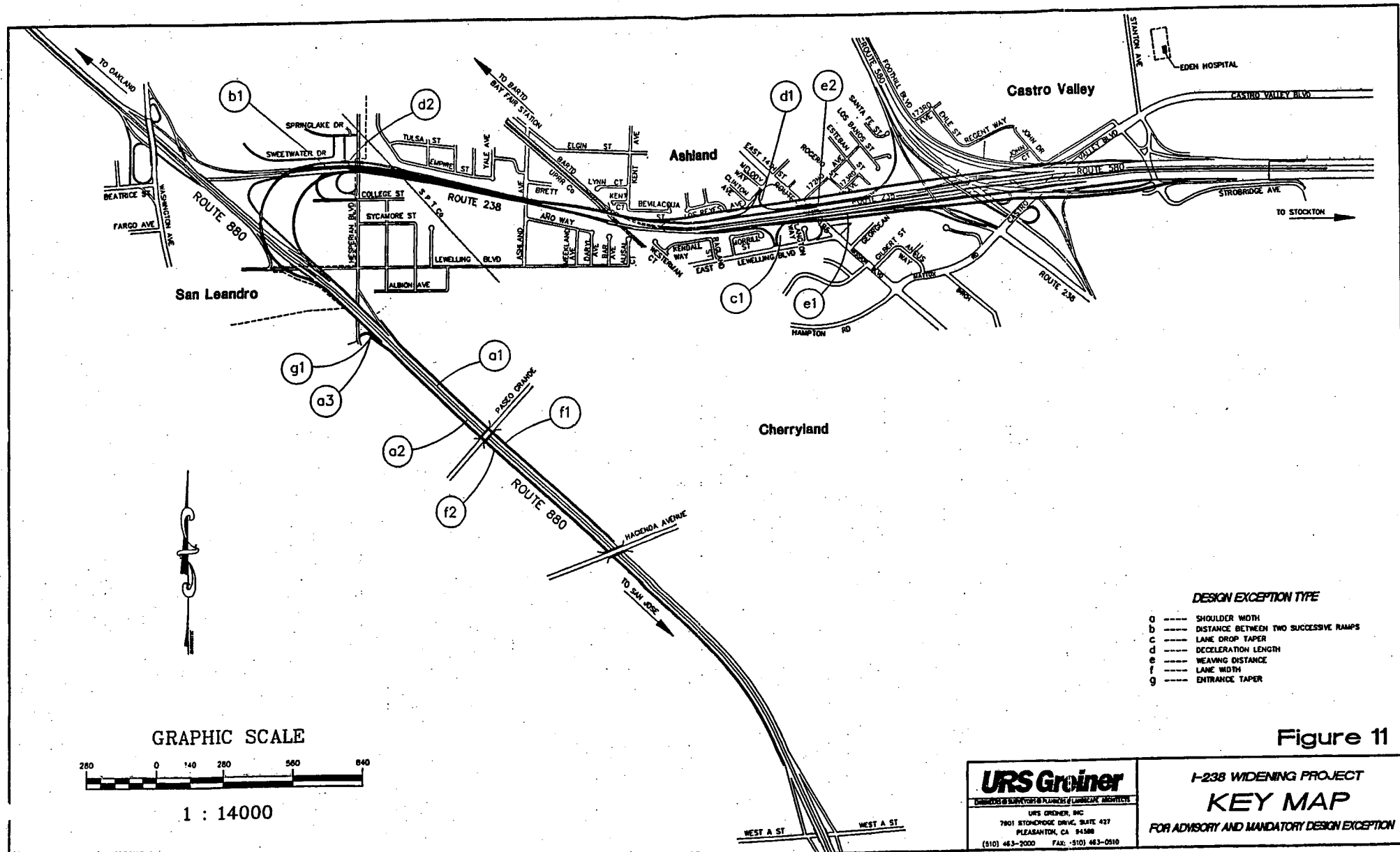
- a = Non-standard shoulder width
- b = Non-standard distance between On-ramps
- c = Non-standard lane drop taper
- e = Non-standard weaving length
- g = Non-standard entrance taper

ADVISORY DESIGN EXCEPTION REPORT

	Location	Non-Standard Feature	Standard for Which Exception Requested	Reasons for Which Exception Requested	Added Cost to Make Standard
a3	Hesperian Blvd. on-ramp (SB I-880)	No CHP pad is provided while the exist ramp has a CHP pad.	Chapter One, Sec. I of the Ramp Meter Design Guidelines states that enforcement areas should be provided on all two-lane and three-lane ramps with HOV lanes.	To reduce right-of-way acquisition, less soundwall relocation, and most importantly, to minimize the impact to the Lucky building, including truck circulation and access.	The standard could be obtained for this ramp by acquiring R/W and significantly modifying Lucky building. It would cost approximately \$1,400,000 (total) to make both these items std.
b1	College St. (Hesperian Blvd) on-ramp (to SB I-238) & NB 880 to SB 238 connector	Non-standard distance of 220 m between these two successive on-ramps, while existing distance is about 107 m (350').	Section 504.3 (8) of the Highway Design Manual states that the minimum distance between two successive on-ramps should be about 300 m.	To meet standard, 880/238 connector needs to be pushed easterly, which increases structure widening on Hesperian Blvd. UC (SB, I-238) and Clark Ave OH (SB, I-238). In addition, R/W acquisition is probably required.	The standard could be obtained by moving entrance 80 m east. It would cost approximately \$300,000 (on structures) to make this item standard.
c1	Lewelling Blvd. on-ramp (SB I-238)	Non-standard lane drop taper of 15:1 is provided.	Section 504.3 (1)(d) of the Highway Design Manual states where conditions preclude the use of 50 to 1 taper, the lane should be dropped using a taper of no less than 30 to 1.	There is no space to develop a full length taper, because this on-ramp is very close to the next off-ramp.	The standard could be obtained by relocating Lewelling Blvd on- & off-ramps. It would cost approximately \$5,800,000 to make this item standard. The cost involves soundwall relocation, new pavement and R/W.
e1	Between Lewelling on-ramp (SB I-238) and Castro Valley Blvd. off-ramp	Non-standard weaving length of 260 m, which is about the same as the existing (253 m).	Section 504.7 of the Highway Design Manual states that on main freeway lanes the weaving length should not be less than 500 m.	There is no space to provide a desired weaving length.	See solution c1.
e2	Between E. 14th St. off-ramp & EB 580 to NB 238 connector	Non-standard weaving length of 272 m, which is about the same as the existing (287 m).	Section 504.7 states that on main fwy lanes the weaving length should not be less than 500 m.	There is no space to provide a desired weaving length.	See solution d1.
g1	Hesperian Blvd on-ramp (SB I-880)	35:1 entrance taper is provided, while the existing taper is 50:1.	Section 504.2 (2) of the Highway Design Manual specifies that design of freeway entrances and exits should conform to the standard designs illustrated in Figure 504.2A.	To reduce right-of-way acquisition, less soundwall relocation, and most importantly, to minimize the impact to the Lucky building, including truck circulation and access.	The standard could be obtained by acquiring R/W from residential rear. It would cost approx. \$600,000 to make this item standard.

Notes: 1. Sections and Tables mentioned in this report refer to the Caltrans Highway Design Manual, Metric Fifth Edition, 1995.

2. For purposes of this report, the terms "left" and "right" are in relation to the direction of travel.



on-ramp from northbound I-238. The Project would increase P.M. peak hour throughput on southbound I-238 by 50 percent, and would decrease maximum delays by about 60 percent.

Impacts of No Measure B project at 2005 The effectiveness of the proposed auxiliary lane on northbound I-880 from Hacienda Avenue to 880/238 connector was evaluated by CCS. The existing traffic often queues in the right lane approaching the connector during the peak periods. The peak hour traffic volumes on this ramp are between 1,500 and 1,600 vehicles per hour (VPH), which is below the theoretical capacity of 1,800 to 2000 VPH for a freeway-to-freeway connector. Therefore, it appears that the major constrain occurs on southbound I-238 rather than on the ramp itself.

Under existing traffic flows, an auxiliary lane on northbound I-880 would certainly provide additional storage for queues, which could reduce impacts of off-ramp queuing on northbound I-880 traffic operations. However, the auxiliary lane would not relieve the major constraints on traffic flow to southbound I-238 or reduce overall vehicle delays on the movement from northbound I-880 to southbound I-238, because the proposed Caltrans I-238 SB Auxiliary Lane would relieve a major constraint on traffic flow on southbound I-238 and therefore reduce queuing on the northbound I-880 off-ramp to southbound I-238. Consequently, the northbound I-880 auxiliary lane does not appear necessary or beneficial up to year 2005. By 2025, however, some queuing on the connector is again projected; the auxiliary lane would then provide additional queuing area and reduce potential impacts on I-880 northbound operations.

The northbound I-880 auxiliary lane would be required per Caltrans design standards if the 880/238 connector is reconstructed to two-lane ramp as a part of any projects.

Level of Service Analysis The peak hour constrained volumes on critical segments of the I-238 and I-880 freeways were compared to capacities using the procedures described in Chapter 3 of the 1994 *Highway Capacity Manual* (HCM). If the constraint analysis indicated that the freeway segment would be in queued conditions, the level of service was assumed to be LOS F regardless of the projected traffic volume or HCM analysis results (Table 4).

The level of service analysis indicates that the I-238 project would mitigate congested LOS F conditions on northbound I-238 in the P.M. peak but not in the A.M. peak. The project would result in poorer level of service on southbound I-238, although the southbound segment would carry 50 percent more traffic with the project. The additional throughput on I-238 would result in poorer levels of service on I-880. Despite these level of service results, the project would have an overall benefit in terms of travel time and delay, as described below.

- Reduction in overall vehicle-hours of delay in the area, despite potential impacts on I-880.
- Reduction of peak hour queuing, which will help to improve safety and reduce potential impacts on westbound I-580.

Table 4
Freeway Level of Service

Freeway Segment	2005 No Project		2005 Project		2025 No Project		2025 Project	
	AM	PM	AM	PM	AM	PM	AM	PM
I-238 (East 14th Street - Hesperian Blvd.)								
Northbound	F	F	F	D	F	F	F	D
Southbound	C	D	C	F	C	F	D	F
I-880 (Winton Avenue - A Street)								
Northbound	D	D	E	E	E	E	F	F
Southbound	E	E	F	F	E	E	F	F

- Reductions in traffic volumes on parallel surface streets, with some net improvements in operations at street intersections.

For more technical evaluation of future traffic operations, refer to Section 4 of *Traffic Operations Analysis Report*.

Recommended Option All Alternatives/options should be presented at an open house to receive public comment on them. The Project Development Team (PDT) should meet following the public meeting to determine a recommended option. Construction costs and right-of-way impacts are primarily the merits of each option to be considered.

VI. HAZARDOUS MATERIALS/WASTE

Hazardous Waste: There is potential aerial lead contamination in unpaved areas due to automobile exhaust. Testing will be done during the early PS&E stage upon request from the Project Engineer. If test results reveal that soils are contaminated, the materials must be handled according to regulatory requirements. Handling materials may include implementing a health and safety plan, reusing materials in accordance to the June 7, 1995 Department of Toxic Substance Control Lead Contaminated Soils Variance, or disposing materials off-site.

There is also potential asbestos contamination in homes built before 1978 in project area. The homes are located near Melody Way and 170th Avenue in San Leandro and near Via Arroyo in San Lorenzo.

VII. TRAFFIC MANAGEMENT PLAN (TMP)

All the build alternatives/segments will require stage construction. Further development of a Traffic Management Plan (TMP) will be discussed in the Project Report to be prepared at a later date for this project.

A public awareness campaign, in cooperation with local print and broadcast media, should be considered, as well as public workshops in advance of construction. Additionally, the project should incorporate the use of COZEEP (Construction Zone Enhanced Enforcement Patrol), a freeway service patrol and changeable message signs, for increased safety and awareness during construction.

Stage Construction

Due to the uncertainty of the funding for this project, either segment can be constructed first, or each segment could be built at the same time. However, it is very likely that Segment 1 would be constructed first due to the favorable funding associated with this segment (STIP funding). A preliminary staging study found that to construct each segment simultaneously provides for the most flexibility in maintaining existing traffic patterns. Therefore, the following is a brief description of construction sequencing for each segment assuming that they are constructed separately.

Some Traffic Operations System (TOS) elements were installed along I-238 and I-580 at various locations during the I-238/BARTD and I-580/BARTD DPX projects. It is required by Caltrans that all existing on-line TOS elements stay operational during the construction. Any affected TOS equipment, because of this widening project, will be fully replaced and/or relocated.

The details of landscaping in the construction area should be addressed in the Project Report and each landscape project should be identified as a separate contract.

Segment 1

This segment includes the addition of a third lane on the northbound I-238 from the 580/238 connector to the 238/880 Connector, and reconstruction of the Mission Blvd./East 14th St. on and off-ramps. It also includes the addition of an auxiliary lane on SB I-880, south of I-238.

◆ Stage I (see Attachment 10)

- Construct the proposed auxiliary lane along southbound I-880. No major detours are required for this construction. Adjacent lane width could be reduced to 3.3 m (11') during construction, with traffic separated from the construction by use of K-rail barriers.
- Construct new pavement on the northern side of the existing I-238 freeway from Ken Avenue OH to the 238/880 Connector at a raised profile. There are two options to address the grade difference between the existing and proposed freeway pavement:

(1) Build a temporary retaining wall, as shown in Attachment 11; and (2) Build extra detour pavement (1.8 m or 6' minimum) to provide enough room for a slope. The detour pavement could be removed after construction. See typical section C-C of Attachment 10.

- Construct new structures (portion) at Ashland Avenue UC and 238/185 Separation. The new portions will be 8.5 m (28") minimum width. See typical sections D-D and G-G of Attachment 10.
- Construct a new retaining wall between Ashland Avenue UC and Kent Avenue OH to support new pavement. Sheet piles are suggested during the construction. The existing sound wall will be removed and a new one constructed on top of the new retaining wall. See typical section E-E of Attachment 10.
- Construct new pavement inside of the existing I-238 freeway from Kent Avenue OH to the 238/185 Separation at the raised profile. The existing sound wall between Mission Blvd and Kent Ave will be reconstructed. See typical section F-F of Attachment 10.

◆ Stage II (see Attachment 11)

- Route the traffic onto the new main line of the I-238 freeway. Since the new NB I-238 lanes are about 1.2 m (4') higher than SB I-238, slope stabilization or a retaining wall will be required to make up this difference. This project assumes that the temporary retaining wall option will be selected. See typical section C-C of Attachment 11.
- Complete the construction of the structures at the Ashland Avenue UC and the 238/185 Separation. See typical sections D-D and F-F of Attachment 11.
- Complete the construction of the new pavement between the Kent Avenue OH and the 238/185 Separation. Reconstruct sound walls. See typical section E-E of Attachment 11.

Segment 2

This segment includes the addition of an auxiliary lane on northbound I-880, reconstructing the 880/238 connector to two lanes, reconstructing the Hesperian Blvd. to SB I-238 on-ramp, including ramp metering, the addition of a third lane on SB I-238 from the 880/238 connector to 238/580 connector, and reconstruction of the Lewelling Blvd. on and off-ramps, including ramp metering. Additionally, portions of I-238 would be reconstructed due to the revised profile associated with bridge reconstruction.

◆ Stage I (see Attachment 12)

- Construct the proposed auxiliary lane along northbound I-880. No major detours are required for this construction. Adjacent lane widths could be reduced to 3.3 m (11') during construction, with traffic separated from the construction by use of K-rail barriers.
- Construct the new 880/238 Connector, the extension of College Street, and College Street on-ramp. This construction will not significantly affect the existing traffic.
- Construct new structures (portion) at the Lewelling Blvd UC, Hesperian Blvd UC, Clark Avenue OH, and Ashland Avenue UC. Typical sections A-A, B-B, C-C and E-E of Attachment 12 indicate the widening dimensions.
- Construct new pavement on the main line of I-238 from Hesperian Boulevard to Ashland Avenue at the raised profile. There are two options addressing the grade difference between the existing and proposed freeway pavement: (1) Build a temporary retaining wall; and (2) Build extra detour pavement (1.8 m or 6' minimum) to provide enough room for a slope. The detour pavement could be removed after construction. See typical section D-D of Attachment 12.
- Construct a second-tier retaining wall between Ashland Avenue UC and Kent Avenue OH to support new pavement. The existing sound wall will be removed and a new one constructed on the top of the new retaining wall. See typical section F-F of Attachment 12.
- Modify two existing bents in order to standardize the outside shoulder width of I-238 at the 580/238 East Connection Separation. An initial review indicates that these bent relocations are possible. However, a thorough engineering study/preliminary design will need to be conducted to determine the true feasibility of this option and the results should be reported in the future Project Report.

◆ Stage II (see Attachment 13)

- Route the traffic onto the new 880/238 connector and new main line of I-238. The existing 880/238 connector can be demolished at this time. Since the new SB I-238 mainline is about 1.2 m (4') higher than NB I-238, slope stabilization or a temporary retaining wall in between is required. This project assumes that the temporary retaining wall option will be selected. See typical section E-E of Attachment 13.
- Complete the construction of the structures at the Lewelling Blvd UC, Hesperian Blvd UC, Clark Avenue OH, and Ashland Avenue UC. See typical sections A-A, B-B, C-C and D-D of Attachment 13.

Segment 3

This segment includes reconstructing Hesperian Blvd UC and Clark Ave OH in the northbound I-238 direction. A portion of I-238 in this area will be reconstructed due to the revised profile associated with this bridge reconstruction.

Segment 3 can be staged in a similar manner as Segment 1. Refer to typical sections A-A and B-B in Attachments 10 and 11 for details.

VIII. ENVIRONMENTAL CLEARANCE

Appropriate Environmental Document

Caltrans has tentatively determined that the appropriate environmental document for the proposed project to be a Negative Declaration/Finding of No Significant Impact (ND/FONSI), because no significant resources appear to be impacted. More detailed studies may change this conclusion. However, a few areas of concern are Socio-Economic, Historic Resources, Hazardous Waste, etc. These areas must be investigated for potential impacts during preparation of the Initial Study and Environmental Assessment (IS/EA).

Air Quality: The project will require traffic forecast and operational analysis to determine Air Quality impacts. Because I-238 has regional significance to peak hour commuters, the project should be included in the Transportation Improvement Plan (TIP) and comply with the 1990 Clean Air Act and the Regional Transportation Plan (RTP).

Noise: A series of measurements were made to determine the current noise environment along the project route. The preliminary noise study showed that sound walls are required on both NB and SB sides of I-238 from Hesperian Blvd. UC to Ashland Ave. UC, because the dominant source of noise at the measurement locations was traffic from the freeway. A school district is located next to I-238 on the south side and residential houses are located on the north side of I-238. It is expected that, due to this widening project, traffic noise will have more impacts to both sides of I-238 within this segment.

Water Quality: Erosion and non-storm water pollution control measures will be developed as part of the Conceptual Storm Water Pollution Prevention Plan (CSWPPP). The plan should be prepared and submitted to the San Francisco Bay Regional Water Quality Control Board within sixty (60) days prior to the beginning of construction. In lieu of upgrading an inadequate drainage facility within the project area, the improvements for pollution prevention and removal of pollutants from storm water discharge will be considered.

Natural Environment: Surveys for sensitive species and habitat types have yielded no significant biological resources that appear to require protection or mitigation. The I-238 corridor (near the I-880 Interchange) is flanked by mature and dense growth of Monterey Pine and Eucalyptus trees on the southern side of the route. The trees provide marginal habitat value due to their proximity to traffic, noise, as well as an absence of adjacent natural areas. No sensitive habitats will be impacted by the project.

Historic Resources: Most of the buildings in the vicinity of this project are post-war tract housing or more recent commercial development. There are five (5) properties that are more than fifty (50) years old. They include:

1. **526 Lewelling Boulevard.** This Italianate (ca. 1870s) house appears to be architecturally significant and is probably eligible for listing on the National Register of Historic Places.

However, it is probably outside the Area of Potential Effect (APE). The house is located on the southern side of Lewelling.

2. **452 and 430 Albion Avenue.** These early 20th-century homes could be effected by proposed right-of-way acquisition at northbound I-880-Hesperian off ramp. They are located on the southern side of Albion.
3. **19610 Mission Boulevard.** This late 19th-century house, with a tank house and bam, appears to lack integrity due to modem alterations. The house is located on the eastern side of Mission Street. The house is probably not eligible for the National Register listing.
4. **1700 Norbridge Avenue, Castro Valley.** This house (currently used as an office) may be outside the Area of Potential Effect (APE).

Any properties that are determined to be within the Area of Potential Effect (APE) should be evaluated for National Register eligibility. The 526 Lewelling Boulevard property is probably eligible for National Register listing.

Archaeology: Currently, there are no recorded archaeological properties within the project area. However, the area has not been subjected to recent archaeological investigation and is located in an environment likely to contain archaeological resources.

An archaeological investigation to identify resources within the project area is required. If archaeological resources are identified, and impacts to the resources cannot be avoided, the significance of the resource must be evaluated through excavation and/or archival research. If the resource is found to be significant, mitigation measures may be necessary.

An archaeological investigation with negative results can be completed in approximately one month, while evaluation and mitigation of resources can take up to two (2) years or more to complete.

Socio-Economic: The proposed project may impact residential homes and businesses along Southbound/Northbound I-238 and along Southbound/Northbound I-880. Specific locations, descriptions, and impacts are included in Table 5. A Socio-Economic Study will be required to determine full impacts and possible mitigation for the above homes and businesses.

Scenic Resources: Detailed studies will be done at a later date.

Hydraulics: Detailed studies will be done at a later date.

Geotechnical: Detailed studies will be done at a later date.

Permit: No permits are needed from regulatory agencies.

At this time, it appears that this project may generate public controversy.

Table 5
ENVIRONMENTAL IMPACTS

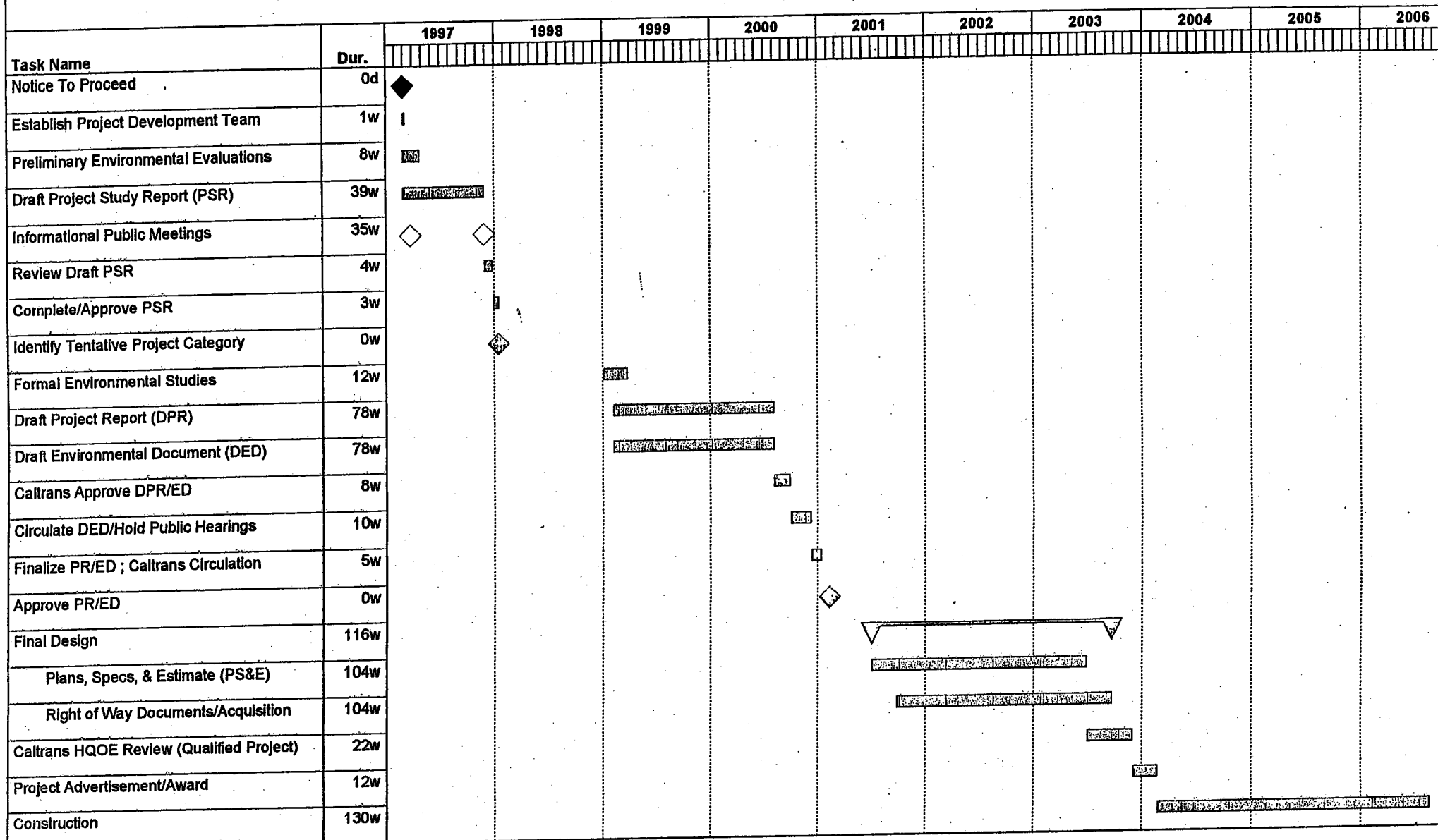
Location	Description	Impacts
Southbound I-238/Route 185 on-ramp.	(Segment 2) Widen to two (2) lanes for ramp metering.	Right-of-way acquisition will have economic impacts on properties at 910 and 912 Lewelling Boulevard.
Southbound I-238 at Union Pacific Railroad Overcrossing.	(Segment 2) Widen Overcrossing.	Right-of-way acquisition may have economic impact on properties at 16730 and 16700 Bar Avenue.
Northbound I-238/Route 185 on-ramp.	(Segment 1) Construct two (2) lane ramp meter.	Right-of-way acquisition will have economic impact on property at 1295 Melody Way.
Southbound I-880 between I-238 and A Street.	(Segment 1). Add a new auxiliary lane and reconstruct the southbound I-880 on-ramp from Hesperian Blvd.	Right-of-way acquisition will have economic impact on approximately three (3) homes. Possible economic impact on Lucky's rear parking.
Northbound I-880 between I-238 and Hacienda Avenue.	(Segment 2). Add an auxiliary lane from Hacienda Avenue to the new two (2) lane connector at southbound I-238.	Right-of-way acquisitions will have economic impacts on approximately four (4) homes (5 parcels).
Hesperian Blvd at College Street.	(Segment 2) Extend College Street, north of Hesperian Blvd.	Right-of-way acquisition will have economic impact on Bakers Square parking lot.

IX. FUNDING/SCHEDULING

The cost of this project requires the project to be segmented. Currently, no known funds are programmed for this project, however, the first segment of the project is a candidate for the State Transportation Improvement Program (STIP), funded by the Regional Improvement Program. The second segment will depend upon the outcome of future voting on Measure B Reauthorization Initiative (Alameda County ½ percent sales tax reauthorization). This is scheduled to go before the voters in 1998. Funding for the third segment of the interim stage and the ultimate portion of the project will need to be funded by a combination of state, federal, and local sources. Caltrans will be responsible for the development of the Project Report and Environment Document, the preparation of the final design and PS&E, and construction administration.

The project schedule for the interim project is shown in Table 6.

I-238 Widening Project Study Report PROJECT SCHEDULE



Project: I-238
Last Revised: 12/10/97
Submitted by: S. Kelsey

Task



Milestone ◇

Summary ▽

X. DISTRICT CONTACT

Questions regarding the Project Study Report may be directed to:

Rubin Woo (510) 286-5086
Project Development Team Leader
Caltrans

Frank Furger (510) 836-2560
Alameda County Congestion Management Agency

Scott C. Kelsey (510) 463-2000
Project Manager
URS Greiner, Inc.

Chwen Siripocanont (510) 656-7091
Traffic Consultant
CCS Planning and Engineering, Inc.

XI. ATTACHMENTS

1. Location Map
2. Preliminary Plan of Segment 1 Project
3. Proposed Project and Non-Standard Feature
4. Preliminary Plan of Segment 2 Project – Option A
5. Preliminary Plan of Segment 2 Project – Option B
6. Preliminary Plan of Segment 2 Project – Option C
7. Preliminary Profiles for I-238 and Ramps
8. Preliminary Plan of Truck Bypass Lanes Project
9. Preliminary Profiles for Truck Bypass Lanes and Ramps
10. Preliminary Plan of NB I-238 Stage I Construction
11. Preliminary Plan of NB I-238 Stage II Construction
12. Preliminary Plan of SB I-238 Stage I Construction
13. Preliminary Plan of SB I-238 Stage II Construction
14. Project Cost Estimates
15. Right-of-Way Data Sheet
16. Traffic Operational Analysis Report

I-238 WIDENING PROJECT STUDY REPORT TRAFFIC OPERATIONS ANALYSIS

Prepared for

Alameda County Congestion Management Agency

and

URS Greiner, Inc.

Prepared by

**CCS Planning and Engineering, Inc.
1440 Broadway, Suite 402
Oakland, CA 94612
(510) 267-1800**

April 21, 1998

April 21, 1998



CCS
PLANNING AND ENGINEERING
INCORPORATED

CCS 97031

1440 Broadway, Suite 402
Oakland, California 94612-2024
510/267-1800 • Fax 510/267-1807
email: OAK@ccsoffice.com

Mr. Scott Kelsey
URS Greiner
7901 Stoneridge Drive, Suite 427
Pleasanton, CA 94588

Subject: *Interstate 238 Connector Project Study Report*

Dear Mr. Kelsey:

CCS Planning and Engineering, Inc. is submitting a Traffic Operations Analysis for the Interstate 238 Connector Project Study Report. This report updates and replaces the Draft Traffic Operations Analysis dated December 15, 1997, which was included with a previous PSR submittal. The revisions respond to comments transmitted by Rubin Woo of Caltrans on March 8, 1998. The analysis presented in this report is consistent with the Project Study Report submitted April 21, 1998.

This traffic operations study addresses existing traffic operations, and future traffic operations for the 2005 and 2025 study years without and with the proposed I-238 improvements. The analysis focuses on changes in bottlenecks and queuing which may occur on the I-238, I-880 and I-580 freeways, as well as impacts on surface streets in the area.

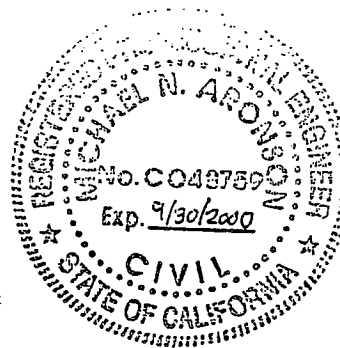
Please call me or Mike Kennedy if you have any questions or comments regarding this traffic study. We look forward to helping you complete this project.

Sincerely,

CCS Planning and Engineering, Inc.

Michael N. Aronson, P.E.
Senior Transportation Engineer

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I-238 WIDENING PROJECT STUDY REPORT TRAFFIC OPERATIONS ANALYSIS

Prepared for

Alameda County Congestion Management Agency

and

URS Greiner, Inc.

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April 21, 1998

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SECTION 1

INTRODUCTION AND SUMMARY

INTRODUCTION

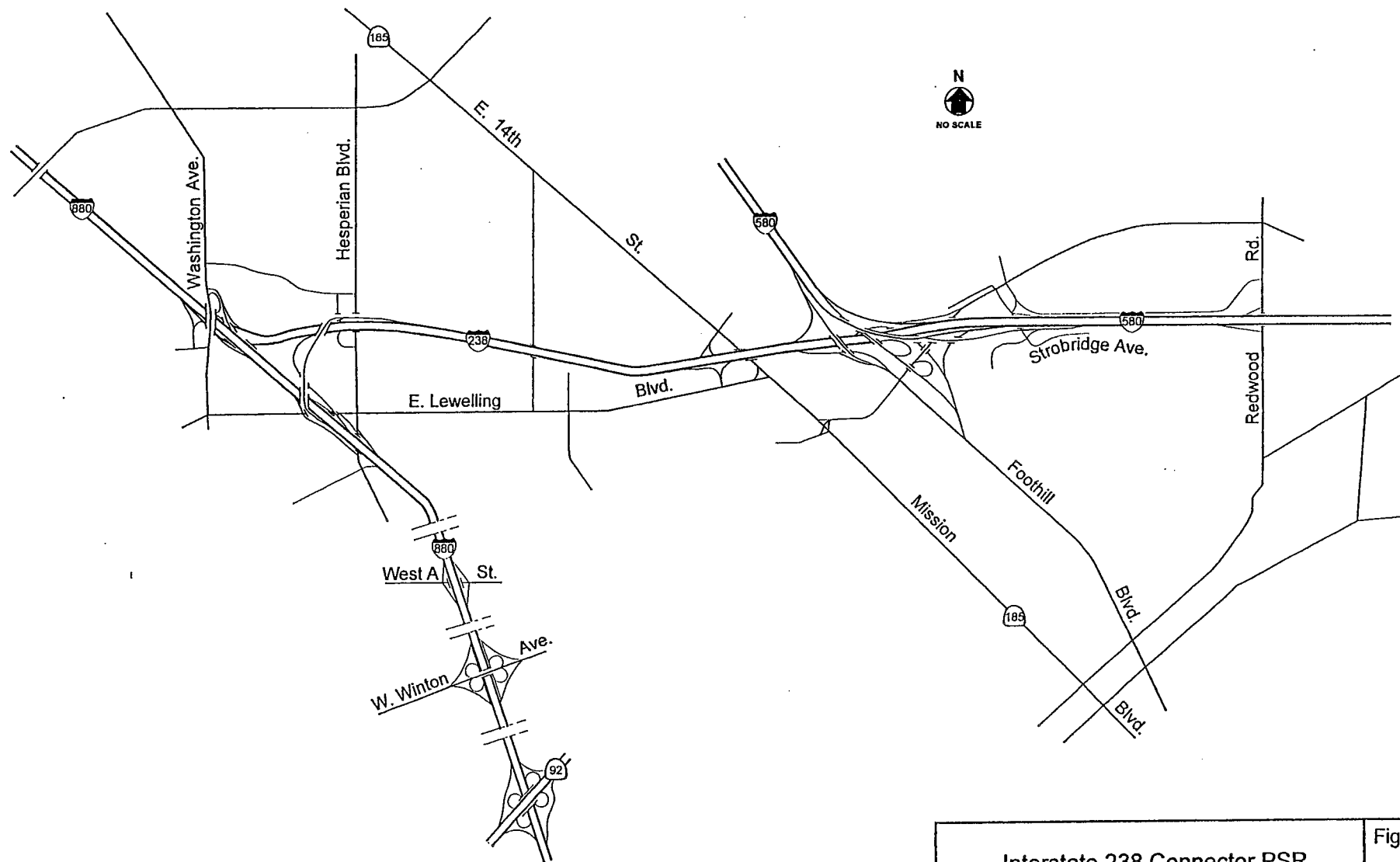
This report presents an analysis of traffic operations for the Interstate 238 Project Study Report (PSR) in Alameda County. The study area includes the freeway section of Interstate 238 (I-238) between I-580 and I-880 (Figure 1). The operations analysis also includes the section of I-580 from Redwood Road to I-238, and the section of I-880 from I-238 to State Route (SR) 92. Traffic operations are evaluated for the following five scenarios:

- 1997 Existing Conditions
- 2005 No Project
- 2005 Project
- 2025 No Project
- 2025 Project

The traffic analysis includes:

- Mainline freeway operations, including constraints at bottlenecks and queue lengths
- Weaving section operations
- Ramp merge and diverge operations
- Intersection operations at ramp termini and at other affected locations

Section 2 of this report presents a discussion of 1997 existing conditions. Section 3 compares future traffic forecasts and operations for the 2005 and 2025 No Project and Project conditions. Section 4 summarizes important traffic operations issues. Calculations are contained in a separate Technical Appendix.



Interstate 238 Connector PSR

Study Area

Figure

1

SUMMARY

Existing peak hour traffic demands on Interstate 238 (I-238) are at or above the capacity of the freeway between I-580 and I-880. Queues occur on northbound I-238 approaching the connecting ramps to I-880, delaying passenger vehicles as well as goods movement between the Central Valley and important Bay Area shipping points. Limited capacity on southbound I-238, and on the connector ramp from northbound I-880, results in P.M. peak queues on northbound I-880, causing delays and safety concerns.

Future traffic increases on I-238 would be constrained by the limited capacity of the freeway. The capacity increases proposed by this Project would increase peak period peak direction throughput on I-238 by 50. These volume increases indicate a significant latent demand for travel on I-238, which can only be accommodated through the capacity increases proposed as part of this Project.

The Project would provide significant increases in throughput on I-238 while decreasing most queues and delays on I-238. The Project would cause some increases in queues and delays on I-880 during the A.M. peak, due to increased volume on the connecting flyover ramp from northbound I-238.

During the 2005 A.M. peak hour, the I-238 project would create an additional 720 vehicle-hours of delay on southbound I-880, and would reduce the vehicle-hours of delay on northbound I-238 by 1,590 vehicle-hours. For the 2025 A.M. peak hour, the project would increase delays on southbound I-880 by about two minutes (350 vehicle-hours), and would decrease delays on northbound I-238 by about 10 minutes (1,190 vehicle-hours). During the 2025 P.M. peak hour, the project would increase delays on northbound I-880 south of I-238 by about one to two minutes. These delay times are based on peak hour traffic calculations only, and should only be used for comparison purposes between scenarios.

The Project would improve surface street operations at several locations, particularly on arterial streets adjacent to the I-238 corridor such as Lewelling Boulevard and Mattox Road. Peak hour volumes would also be reduced on parallel streets such as A Street, Winton Avenue and Jackson Street.

SECTION 2

EXISTING TRAFFIC OPERATIONS

The existing conditions are evaluated in terms of mainline freeway operations, freeway ramp operations and street intersection operations.

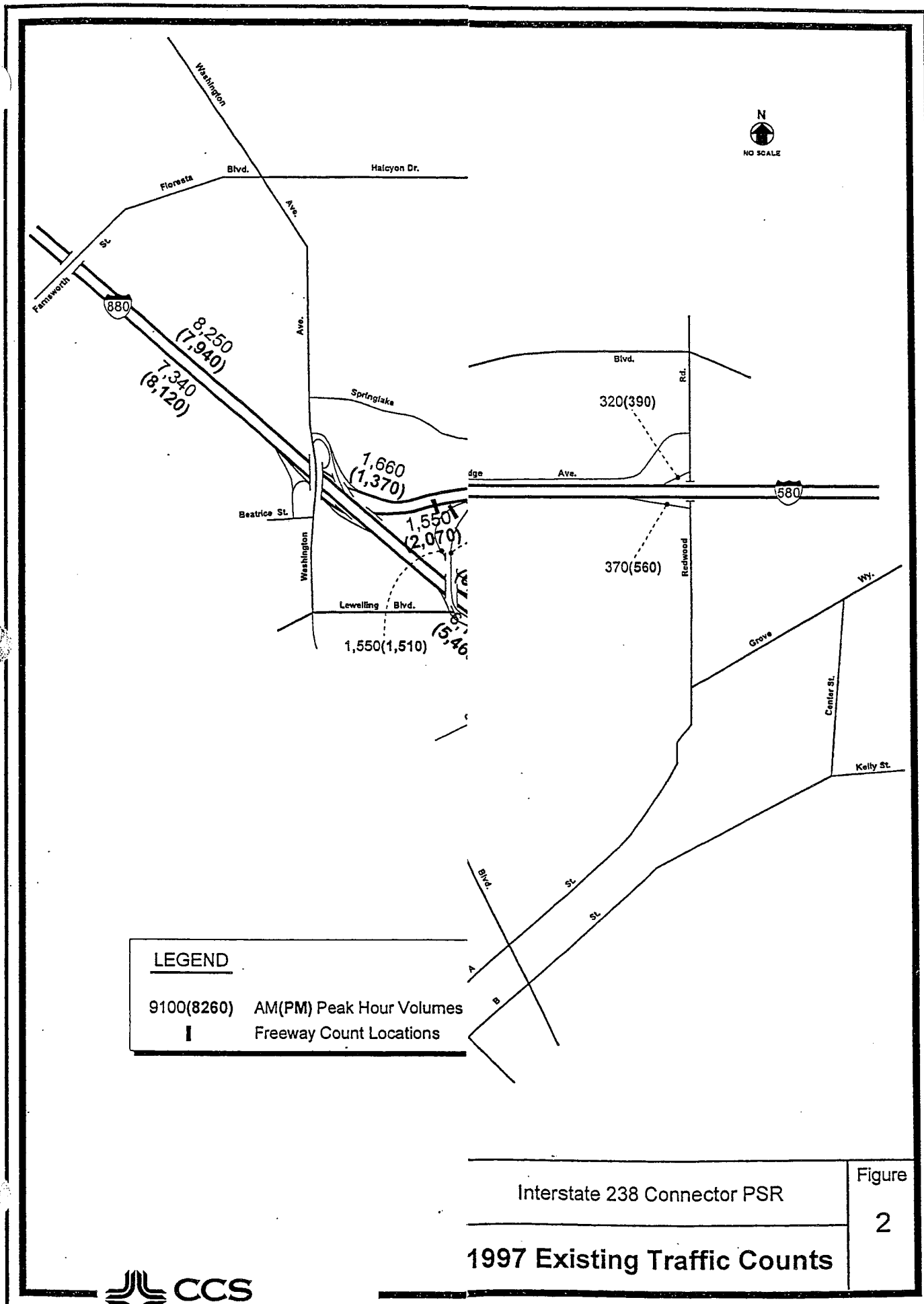
EXISTING TRAFFIC VOLUMES

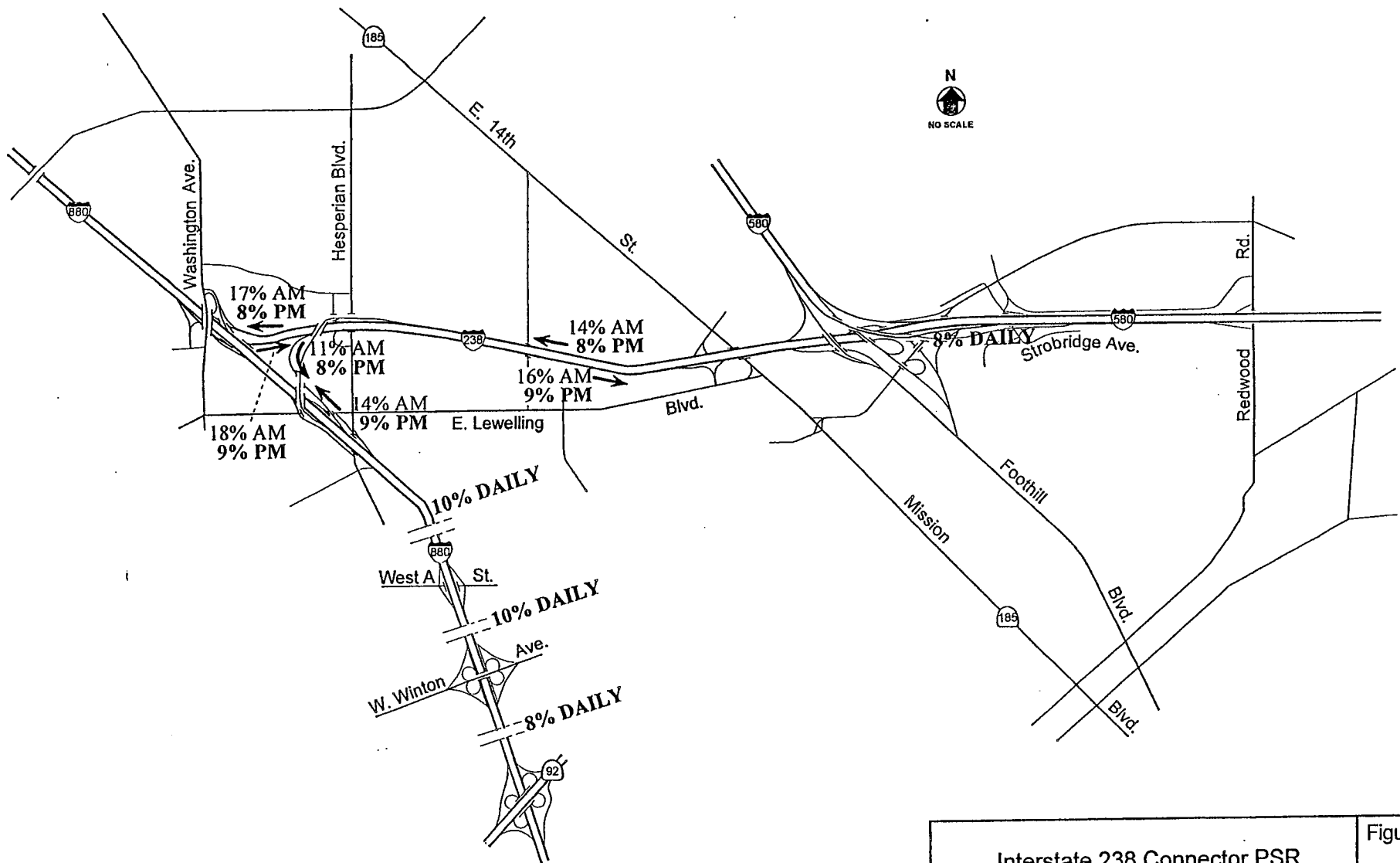
Existing traffic volumes on the mainline freeway and ramps are based primarily on traffic counts provided by Caltrans (Figure 2). The majority of the Caltrans traffic counts were taken during the fall of 1996, using several permanent loop detector count stations on the mainline freeway and hose counters on ramps. Several ramp volumes on I-880 were updated based on traffic counts from May 1997, using counts from recently installed loop detectors used for ramp metering.

CCS conducted additional peak period counts on the four freeway-to-freeway ramps connecting I-238 with I-880 during August, 1997. These freeway-to-freeway ramp counts included vehicle classification counts to determine directional truck movements. The vehicle classification counts were combined with Caltrans truck volume data to provide the truck percentages for each freeway segment in the study area (Figure 3).

Traffic counts at ramp and street intersections were compiled from a variety of sources, including Alameda County, the City of Hayward, and traffic counts conducted by Marks Traffic Data Services for this study in July, 1997.

In several locations, the combination of upstream counts on the mainline freeway and ramps do not match the counted throughput on a downstream section of the freeway. This is due to bottleneck locations and queuing, which restrict the throughput on certain sections of the freeway.





Interstate 238 Connector PSR

Truck Percentages

Figure

3

For example, the combination of mainline freeway counts and ramp counts on northbound I-238 south of East 14th Street indicate a demand of 4,950 during the A.M. peak hour, but the counted throughput north of East 14th Street was only 3,790. The remaining 1,160 vehicles are stored in the queue on I-238, and do not get past East 14th Street until after the end of the peak hour. The estimation of "unconstrained" demand is described below.

Unconstrained Existing Traffic Demand

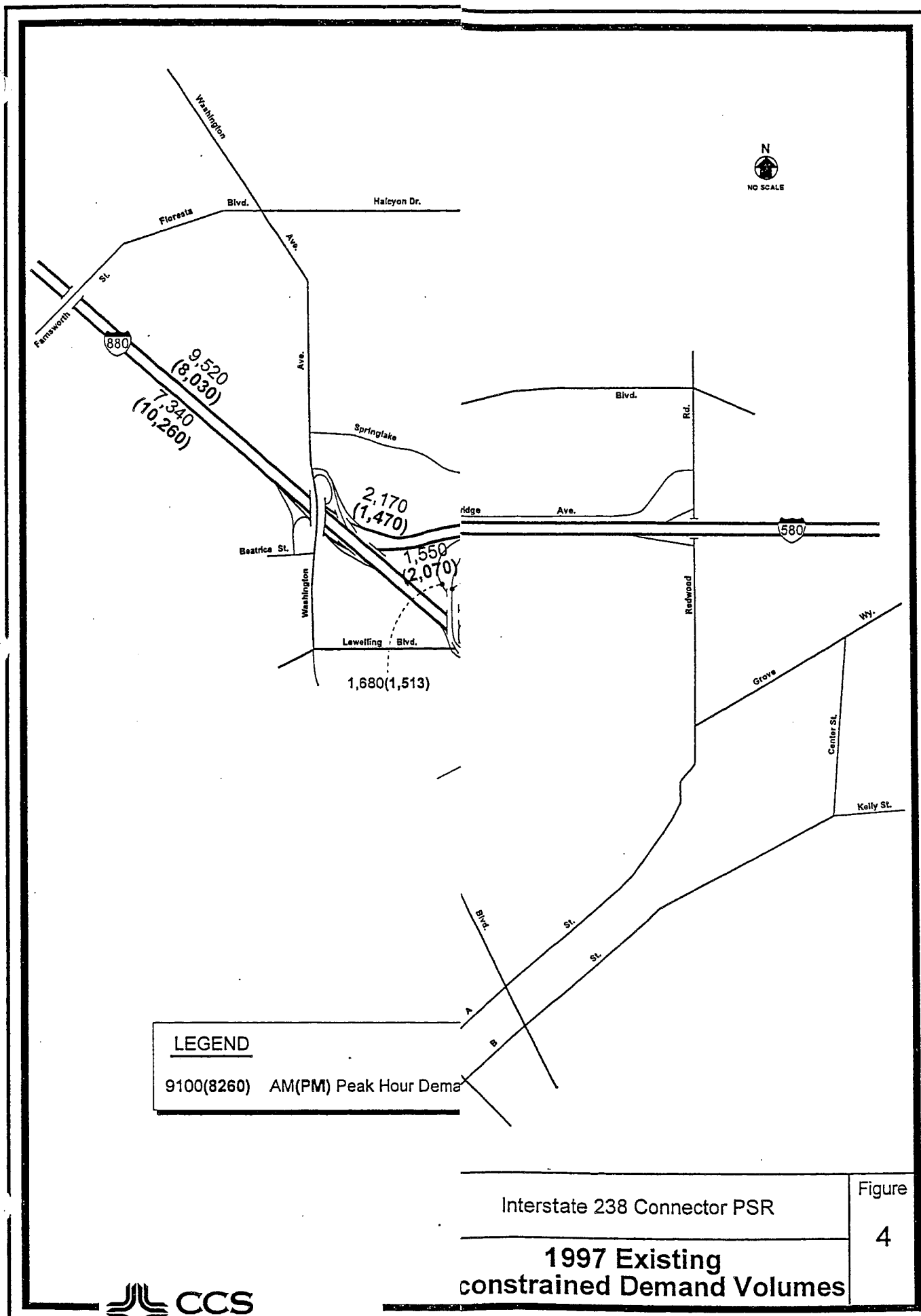
As noted above, the counted traffic volumes on the I-238, I-580 and I-880 freeways and ramps do not result in consistent flows from segment to segment due to queuing. A set of unconstrained existing demand volumes were desired to represent the potential existing traffic flows if bottlenecks did not restrict flows. The unconstrained volumes are used for several purposes:

- Confirm bottleneck locations
- Test procedures used to evaluate future traffic demands
- Provide a set of traffic volumes which could be compared to future traffic forecasts, as unadjusted traffic forecasts always assume consistent flow between segments.

Unconstrained traffic demands were estimated using the higher throughput volumes in the less congested segments of each freeway. Demand volumes on mainline freeway segments and on- and off-ramps were calculated by starting at higher throughput segments, and adjusting volumes until the addition and subtraction of ramp volumes resulted in consistent traffic volumes throughout each corridor (Figure 4). Individual ramp volumes were adjusted using procedures for analysis of freeway impacts when demand is greater than capacity described in "Freeway Operations Analysis Course Notes" prepared for Caltrans by Leonard Newman.

LEVEL OF SERVICE

The quality of traffic flow on roads and intersections is evaluated in terms of "level of service" (LOS) which is a measure of driving conditions and vehicle delay. Levels of service range from A (best) to F (poorest). Levels of service A, B and C indicate conditions where traffic can move relatively freely. Level of service D describes conditions where delay is more noticeable. Level of service E describes conditions where traffic volumes are at or close to capacity, resulting in significant delays and average speeds which are one-third the uncongested speed or lower. Level of service F characterizes conditions where traffic demand exceeds available capacity, with very slow speeds (stop-and-go) and long delays (over a minute) and queuing at signalized intersections.



MAINLINE FREEWAY OPERATIONS

Existing mainline freeway operations were evaluated in two ways:

- The traffic counts were evaluated using *Highway Capacity Manual* procedures
- The estimated unconstrained demands were evaluated using Caltrans Newman methods

The two types of analysis provide a more complete picture of existing operations.

Freeway Capacity Analysis

The peak hour traffic counts on each segment of the I-238, I-580 and I-880 freeways were compared to capacities using the procedures described in Chapter 3 of the 1994 *Highway Capacity Manual* (HCM). The HCM procedures start with ideal capacities of 2,200 vehicles per lane per hour on four-lane freeways and 2,300 vehicles per hour on six or more lane freeways. Adjustments are made for the variation in traffic flow during the peak hour (the peak hour factor, or PHF, assumed to be 0.95), the percentage of heavy vehicles on the freeway, grades and other design characteristics. The McTrans Highway Capacity Software (HCS) was used to perform the calculations (see Technical Appendix).

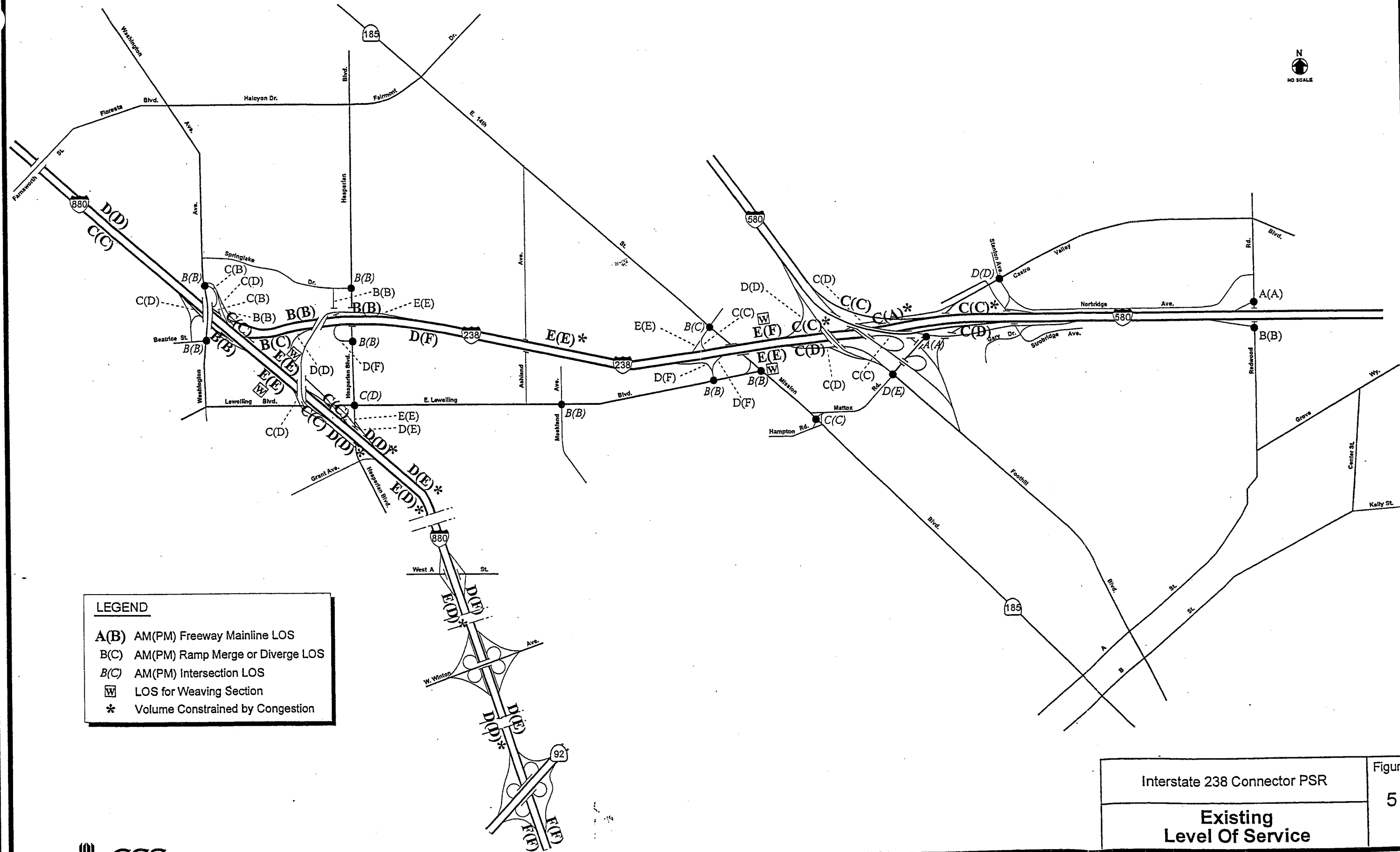
The results of this analysis are included on Figure 5. The analysis indicates that northbound I-238 operates near capacity at LOS E during both peak hours. In the southbound direction, I-238 operates at LOS D during the A.M. peak hour and LOS F in the P.M. peak hour.

On southbound I-880, the analysis indicates LOS D to E during the A.M. peak hour, although observed conditions show that volumes may be constrained by congestion approaching the SR 92 interchange. The analysis indicates LOS D for northbound I-880 during the A.M. peak hour and LOS E to F during the P.M. peak hour, consistent with observed conditions.

Volume Constraint Methodology

The peak hour traffic counts do not always identify the most congested peak hour conditions. Therefore, the estimated unconstrained traffic demands were compared to freeway capacities to determine critical bottleneck locations and queues.

Mainline and ramp volumes were adjusted using procedures for analysis of freeway impacts when demand is greater than capacity, as described in "Freeway Operations Analysis Course Notes" prepared for Caltrans by Leonard Newman. An average capacity of 2,000 vehicles per hour per lane was assumed for this analysis, consistent with the higher truck percentages reported on some-segments of I-238 (see Technical Appendix).



Interstate 238 Connector PSR	Figure 5
Existing Level of Service	

Bottleneck locations were identified by identifying segments where estimated demand volumes exceed calculated capacities. An incremental approach was used, starting with the first bottleneck encountered along the direction of flow. Volumes were constrained based on the first bottleneck, and then the constrained volumes were again compared to capacities. Volumes were then constrained based on a second downstream bottleneck. The process was repeated until all mainline freeway volumes were less than or equal to available capacities.

Mixed flow and high-occupancy vehicle (HOV) lanes were evaluated separately for this analysis. Queues and delays apply to the mixed-flow lanes only.

For this study, the I-580, I-238 and I-880 freeways were treated as a continuous corridor:

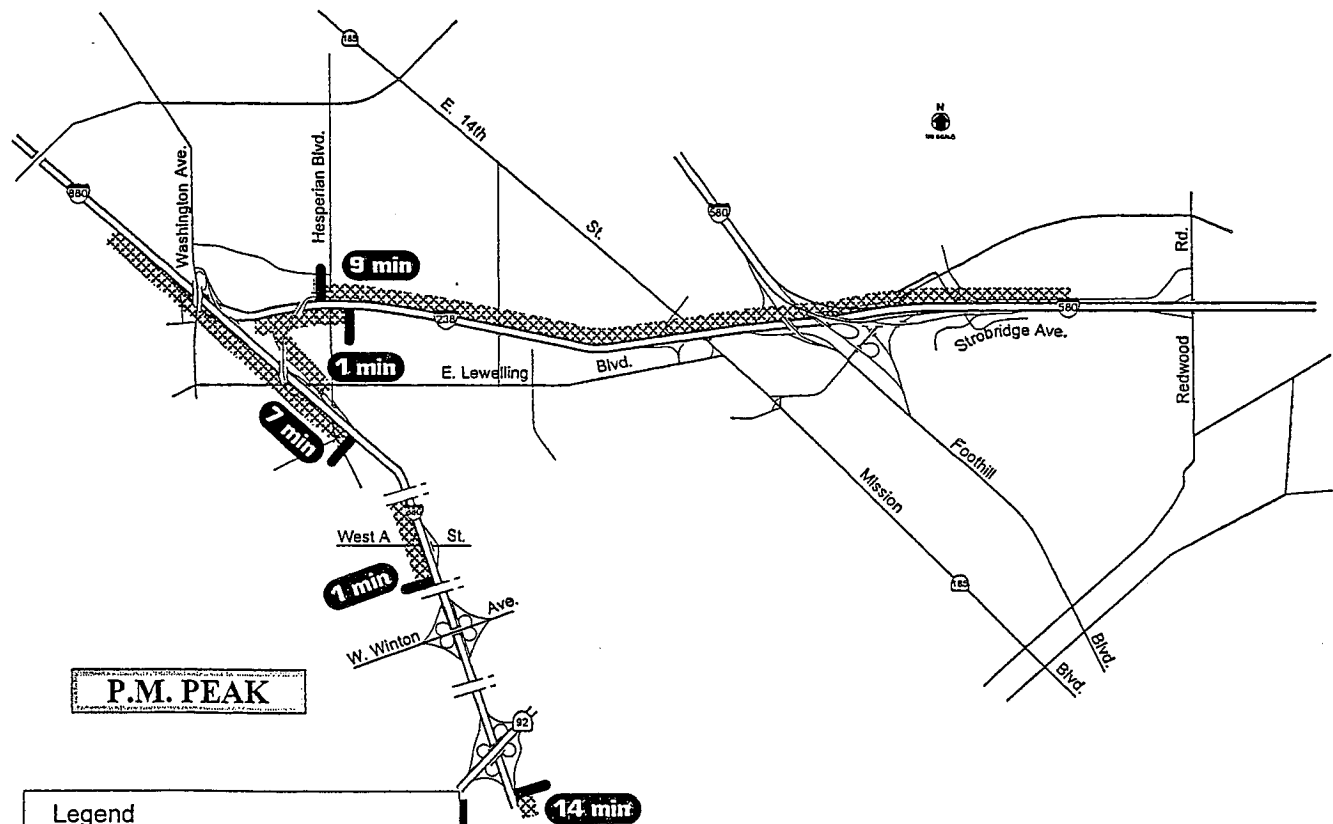
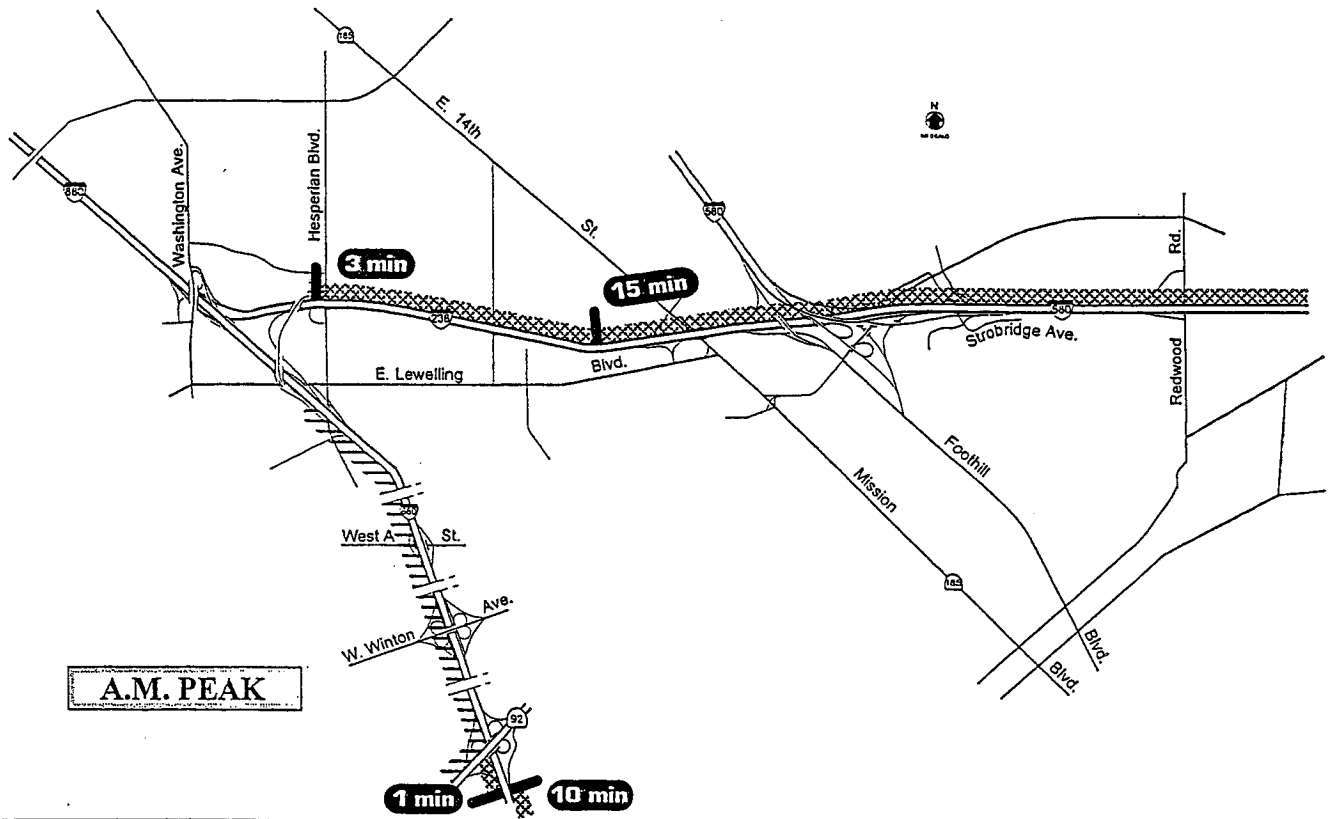
- The "northbound" corridor starts on I-580 at Redwood Road, continues to I-238 northbound, and then continues along the connector ramp to I-880 southbound until SR 92. Several freeway segments were treated as on- or off- ramps, including westbound I-580 west of I-238 (three-lane off-ramp) and the northbound I-238 connector to northbound I-880 (two-lane off-ramp).
- The "southbound" corridor starts on northbound I-880 south of SR 92, continues on the connector ramp to I-238 southbound, and then continues to I-580 eastbound to Redwood Road. The connector ramp from I-880 southbound to I-238 southbound is treated as a two-lane on-ramp, and I-580 eastbound is treated as a three-lane on-ramp.

The analysis of unconstrained traffic demand indicated the following bottlenecks and queue locations (Figure 6):

- A.M. peak, NB I-238 at the single-lane off-ramp to SB I-880 (15 minute maximum delay)
- A.M. peak, on NB I-238 off-ramp to SB I-880 (3 minute maximum delay)
- A.M. peak, NB I-880 approaching SR 92 (10 minute maximum delay)
- P.M. peak, on NB I-238 off-ramp to SB I-880 (9 minute maximum delay)
- P.M. peak, SB I-880 approaching A Street (7 minute maximum delay)
- P.M. peak, SB I-880 approaching Winton Avenue (1 minute maximum delay)
- P.M. peak, NB I-880 approaching SR 92 (14 minute maximum delay)
- P.M. peak, SB I-238 at the end of the connector from NB I-880 to SB I-238 where traffic merges into two lanes (1 minute maximum delay)

The analysis did not identify two queues observed in the field:

- A.M. peak, SB I-880 approaching the off-ramp to WB SR 92
- P.M. peak, NB I-880 approaching the off-ramp to SB I-238



Legend

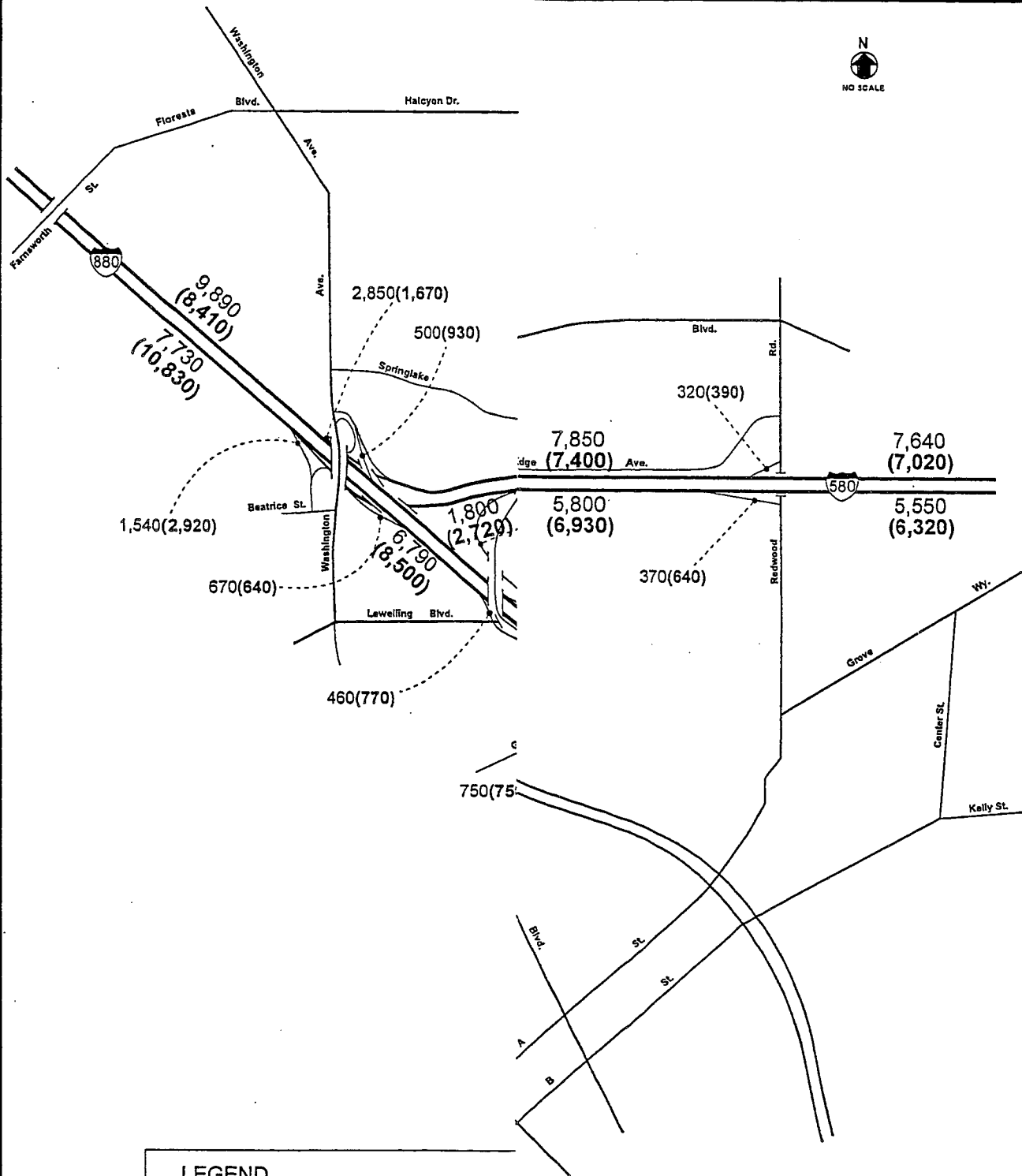
- Vertical bar: Bottleneck Location
- Diagonal lines: Calculated Peak Hour Queue
- 14 min: Calculated Peak Hour Delay
- ||||: Other Observed Queues

Interstate 238 Connector PSR

**Queue Locations
1997 Existing Conditions**

Figure

6



LEGEND

9,100(8,260) AM(PM) Peak Hour Volum

Interstate 238 Connector PSR

Year 2005 No Project
Traffic Demand

Figure

7

It is believed that these queues are due primarily to merging problems at the ends of the connector ramps. The merging problems result in queues on the connector ramps and in the rightmost one or two lanes on the mainline freeway approaching the connector ramps. The overall traffic demands on the mainline freeway do not exceed the total available freeway capacities in these segments.

Weaving Operations

Within the study area, there is one segment in each direction on I-238 and one segment in each direction on I-880 which operate as weaving sections:

- Northbound I-238 from on-ramp from EB I-580 to off-ramp to E. 14th Street
- Southbound I-238 from on-ramp from Lewelling Blvd. to off-ramp to Foothill Blvd.
- Northbound I-880 from on-ramp from Lewelling Blvd. to Washington Ave.
- Southbound I-880 from on-ramp from Washington Ave. to off-ramp to Lewelling Blvd.

Weaving sections are defined in the *Highway Capacity Manual* as freeway segments where vehicles are required to change at least one lane within a maximum distance of 2,500 feet.

The weaving section on northbound I-238 operates at LOS E during the A.M. peak hour and LOS F during the P.M. peak hour. All other weaving sections operate at LOS E during both peak hours (see Technical Appendix for calculations).

FREEWAY RAMP OPERATIONS

Freeway ramp merge and diverge operations were analyzed using the "Ramps and Ramp Junctions Method" from Chapter 5 of the 1994 Highway Capacity Manual (see Technical Appendix for calculations). Figure 5 compares the A.M. and P.M. peak hour level of service (LOS) along the ramps.

Level of service F conditions are indicated during the P.M. peak hour along southbound I-238 at the on-ramp from Hesperian Boulevard and the off and on-ramps at Lewelling Boulevard. These LOS F conditions are primarily due to high volumes on the mainline freeway rather than high ramp volumes. Level of service E operations occur during both the A.M. and P.M. peak hours for the on-ramp merge from East 14th Street to northbound I-238 and the flyover ramp diverge from northbound I-238 to southbound I-880.

INTERSECTION OPERATIONS

Existing conditions at the signalized study intersections were analyzed using the "Operations Method" from Chapter 9 of the 1994 Highway Capacity Manual (Table 1). Analysis assumptions include:

- 120 second average cycle lengths for intersections of two major arterials
- 90 second cycle length for other intersections
- 3 seconds lost time per major signal phase
- Minimum green times of 10 seconds for through movements and 6 seconds for turns

The intersection of the I-238/I-580 off-ramps with Castro Valley Boulevard and Mattox Road currently operates at LOS E during the P.M. peak hour. This is primarily due to high left-turn volumes in the single left-turn lane from westbound Castro Valley Blvd. To southbound Foothill Blvd. Other intersections which operate at LOS D during one or both peak hours include Hesperian Boulevard at Lewelling Boulevard and Norbridge Avenue at Castro Valley Boulevard. All other study intersections operate at LOS C or better. Calculations are included in the Technical Appendix.

Table 1
Existing Intersection Operations

Intersection	AM Peak Hour		PM Peak Hour	
	LOS	Delay	LOS	Delay
Washington Ave. & I-880 NB Ramps	B	11	B	11
Washington Ave. & Beatrice St.	B	8	B	12
Hesperian Blvd. & Lewelling Blvd.	C	23	D	32
Hesperian Blvd. & I-238 SB On	B	6	B	7
I-238 NB Off & Springlake Dr.	B	7	B	8
Meekland Ave. & Lewelling Blvd.	B	14	B	11
I-238 SB Ramps & Lewelling Blvd.	B	12	B	13
E. 14 th /Mission & Lewelling Blvd.	B	10	B	12
E. 14 th /Mission & I-238 NB Ramps	B	11	C	15
E. 14 th /Mission & Mattox Rd.	C	16	C	18
I-238/I-580 Off & Castro Valley/Mattox	D	33	E	55
Foothill/I-238 NB On & Castro Valley Blvd.	A	1	A	1
Norbridge Ave. & Castro Valley Blvd.	D	26	D	29
Redwood Rd. & I-580 WB On	A	4	A	3
Redwood Rd. & I-580 EB Off	B	6	B	7

Notes:

LOS = Level of service

Delay = Average delay for all vehicles passing through intersection, in seconds

PLANNED TRANSPORTATION IMPROVEMENTS

Several road improvements are under construction or planned for the I-238 study area.

I-238 Auxiliary Lane Project

Caltrans has programmed a traffic flow improvement project which will provide an auxiliary lane on southbound I-238 between the on-ramp from northbound I-880 and the Southern Pacific Railroad overcrossing. This improvement will provide additional distance for merging maneuvers between the on-ramp from I-880 and the on-ramp from Hesperian Boulevard.

Route 238 Expressway (Hayward Bypass)

An SR 238 expressway is planned which would extend from the existing interchange of I-238 with I-580 to a connection with Mission Boulevard near Tennyson Road.

I-880/SR 92 Interchange

Improvements are planned at the interchange of I-880 with SR 92. The improvements would provide a two-lane ramp from southbound I-880 to westbound SR 92, and a flyover ramp from eastbound SR 92 to northbound I-880. Caltrans is currently studying alternatives for these interchange improvements.

SECTION 3

FUTURE TRAFFIC OPERATIONS

Future traffic operations with 2005 and 2025 projected traffic volumes are evaluated for two scenarios:

- No Project
- Project

The analysis of future traffic operations includes a comparison of traffic demands, mainline freeway operations, weaving operations and intersection operations.

FUTURE TRAFFIC DEMAND

A regional travel forecast model was applied to provide A.M. and P.M. peak hour traffic volumes for the 2005 and 2025 No Build and Build conditions.

Travel Forecast Model

Future traffic demands were projected using the Planning Area 2 version of the Alameda County travel model. The Alameda County model was developed by the Alameda County Congestion Management Agency (CMA) to include the entire nine-county Bay Area with additional detail in Alameda County. The Alameda County model has been calibrated to replicate existing and future regional travel patterns generated by the Metropolitan Transportation Commission.

The Planning Area 2 version of the Alameda County model includes additional road network and land use information in Hayward and the adjacent unincorporated areas such as Castro Valley and San Lorenzo. The additional detail helps to provide more accurate forecasts of traffic volumes on local area streets.

The model considers future changes in travel patterns caused by development and congestion, and also considers use of existing and improved transit services. The model is sensitive to the capacities of various facilities, so increases in capacity on a particular segment of I-238 may induce additional traffic to divert to I-238 from parallel routes.

Adjusted Traffic Demand

The regional travel model provides good estimates of regional and corridor travel demand. In many locations (for example, on I-880), it also provides good estimates of traffic on individual road segments. However, the model may not be accurate on each road segment and ramp. Therefore, it is common practice to adjust the model traffic forecasts based on existing traffic count information.

The travel model also partially constrains traffic demand on each road segment based on the capacity of the segment. While this procedure provides a more realistic estimate of diversion patterns, it does not produce estimates of the actual total demand for travel on a particular congested road segment.

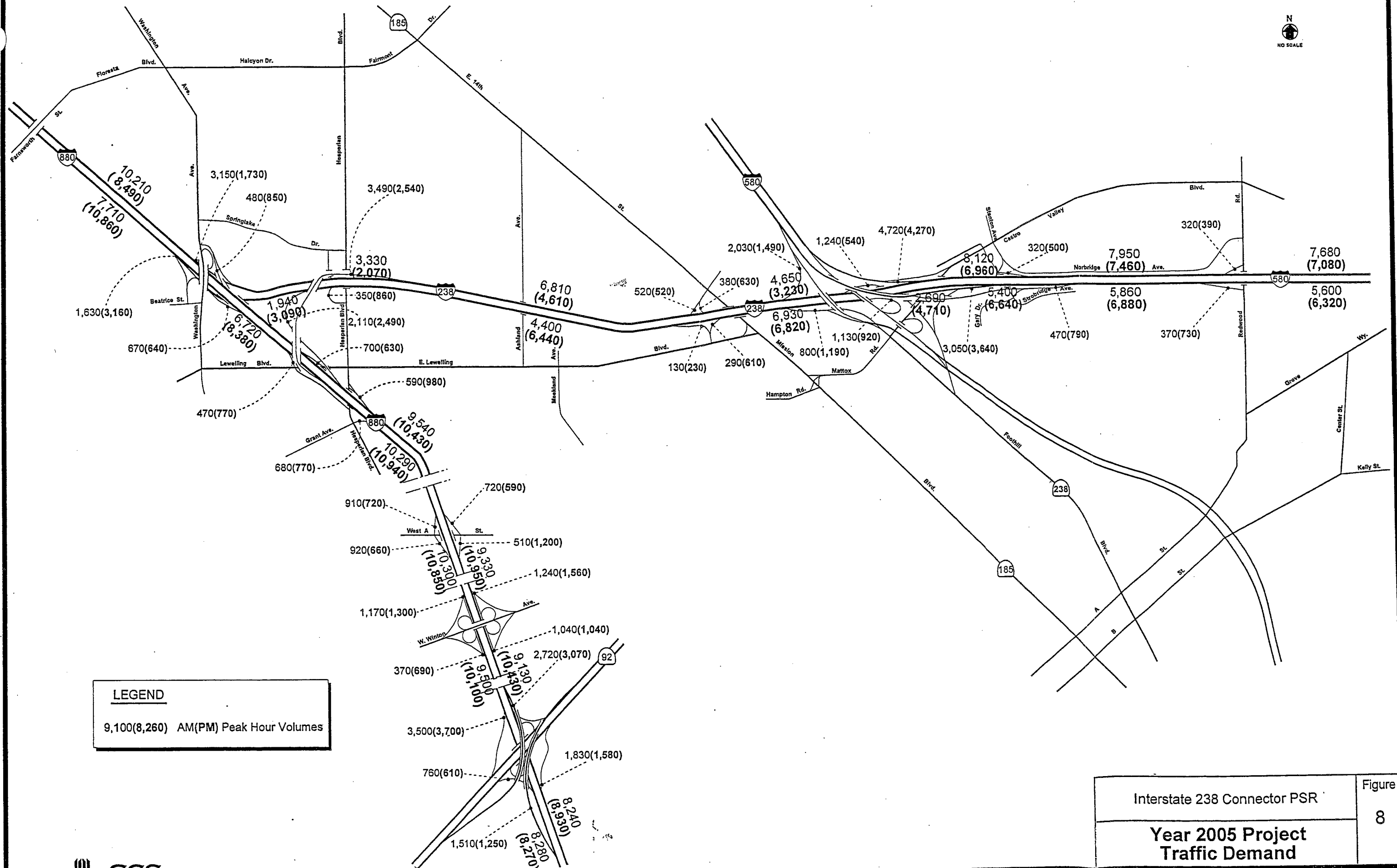
The following steps were used to calculate future traffic demand:

- The growth increment between the model forecast volume and the model 1996 volume estimate was calculated for each freeway segment and ramp.
- The growth increment was added to the 1997 unconstrained demand volume estimate (see Figure 4) to calculate the future traffic demand.
- If the model predicts a future traffic demand which is lower than the existing traffic demand, the existing traffic demand volume is used for the future forecast.

Details of these volume calculations are included in the Technical Appendix.

2005 No Project. The 2005 No Project demand volumes on northbound I-238 would be six percent or less higher than 1997 existing (Figure 7). The demand on southbound I-238 is projected to increase more significantly, by 13 percent in the A.M. peak hour and by 36 percent in the P.M. peak hour. Traffic demand on southbound I-880 is projected to increase by up to six percent, while P.M. peak hour traffic demand on northbound I-880 would increase by up to 18 percent.

2005 Project. The 2005 Project would increase northbound I-238 A.M. peak hour traffic demand by nearly 30 percent compared to 2005 No Project, and would increase southbound P.M. peak hour traffic demand by about 13 percent (Figure 8). The 2005 Project would also increase traffic demand on southbound I-880 north of A Street by about six percent in the A.M. peak hour and three percent in the P.M. peak hour.



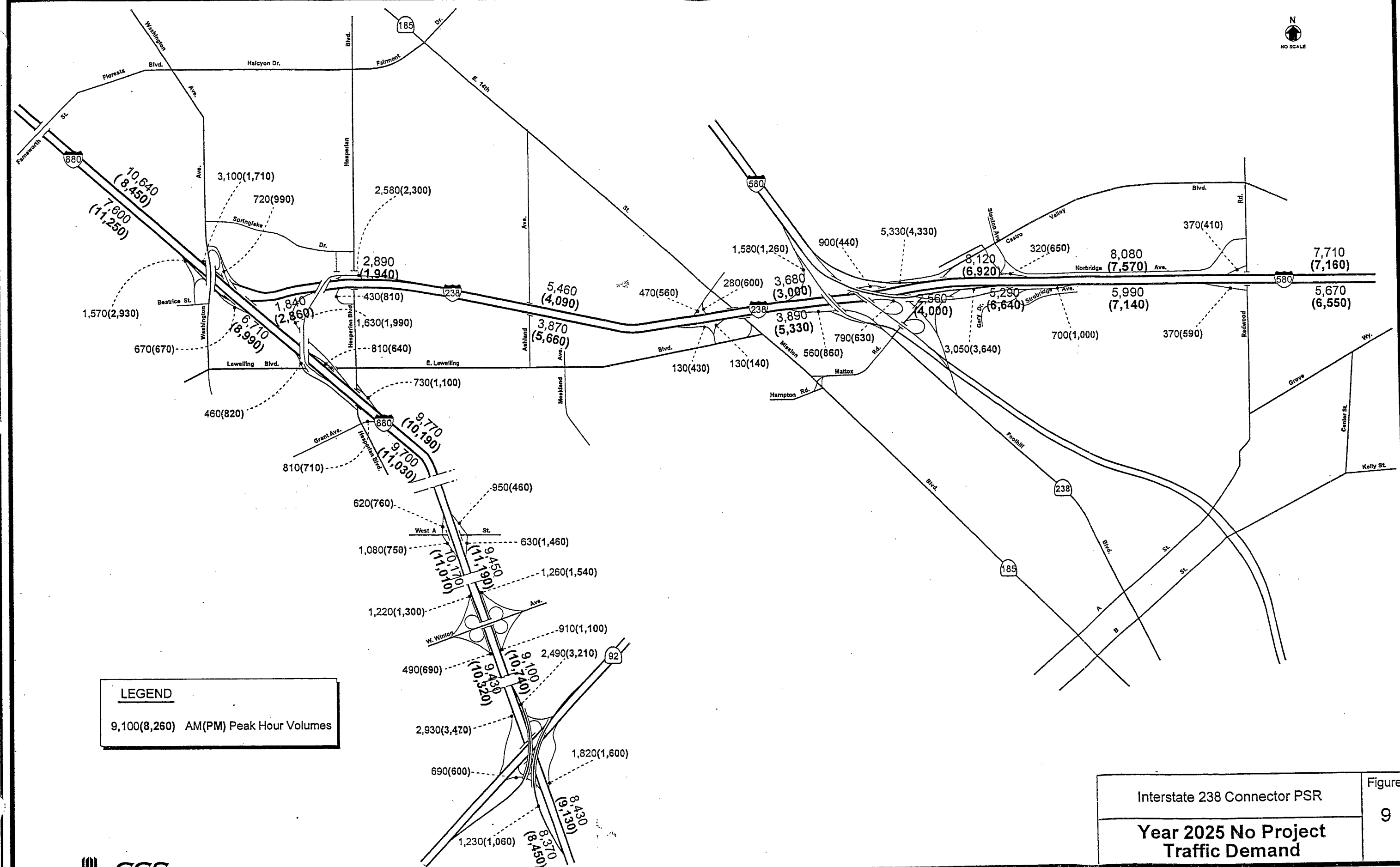
LEGEND

9,100(8,260) AM(PM) Peak Hour Volumes

Interstate 238 Connector PSR

**Year 2005 Project
Traffic Demand**

Figure
8



LEGEND
9,100(8,260) AM(PM) Peak Hour Volumes

Interstate 238 Connector PSR	Figure 9
Year 2025 No Project Traffic Demand	

2025 No Project. The 2025 No Project volumes on I-238 would be slightly higher than the 2005 No Project volumes (Figure 9). Traffic demand on I-880 south of I-238 would be up to about four percent higher than 2005 No Project volumes.

2025 Project. The 2025 Project would increase northbound I-238 A.M. peak hour traffic demand by 30 percent compared to 2025 No Project, and would increase southbound P.M. peak hour traffic demand by about 30 percent (Figure 10). The 2025 Project would also increase peak hour traffic demand on I-880 by up to eight percent compared to 2025 No Project volumes.

Constrained Traffic Forecasts

The traffic model represents partially constrained traffic demand rather than actual throughput, and traffic demand forecasts from the model may exceed capacities of certain road segments. Therefore, the traffic demands were adjusted based on the actual capacities of the mainline freeway. The Caltrans Newman methods were used to identify bottlenecks, adjust mainline and ramp volumes upstream and downstream of bottlenecks, and estimate queue lengths and delays. Calculations are included in the Technical Appendix.

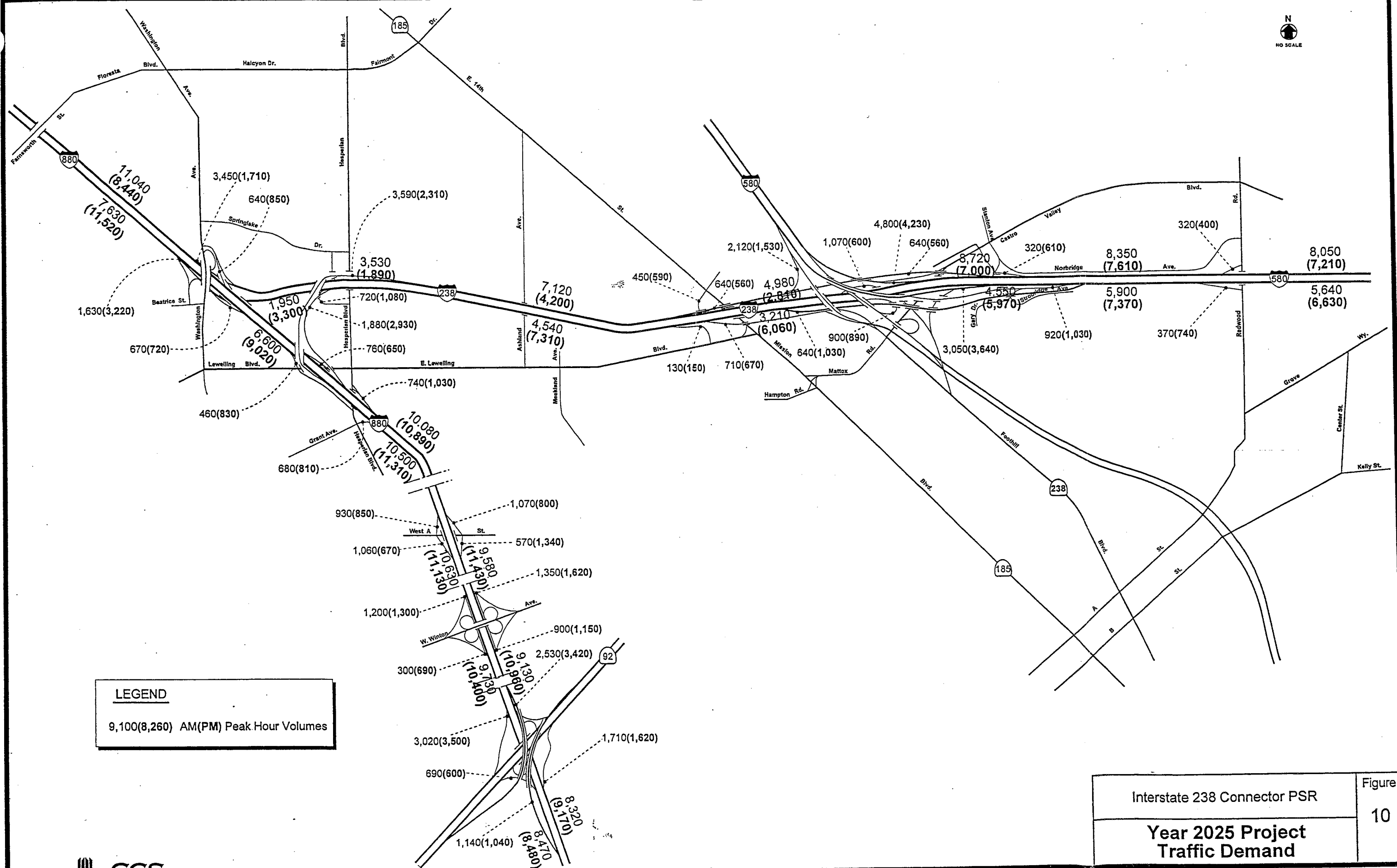
MAINLINE FREEWAY OPERATIONS

Projected traffic demands on the mainline freeway segments were compared to capacities for all future scenarios. Critical bottleneck locations and queue lengths were identified.

2005 No Project

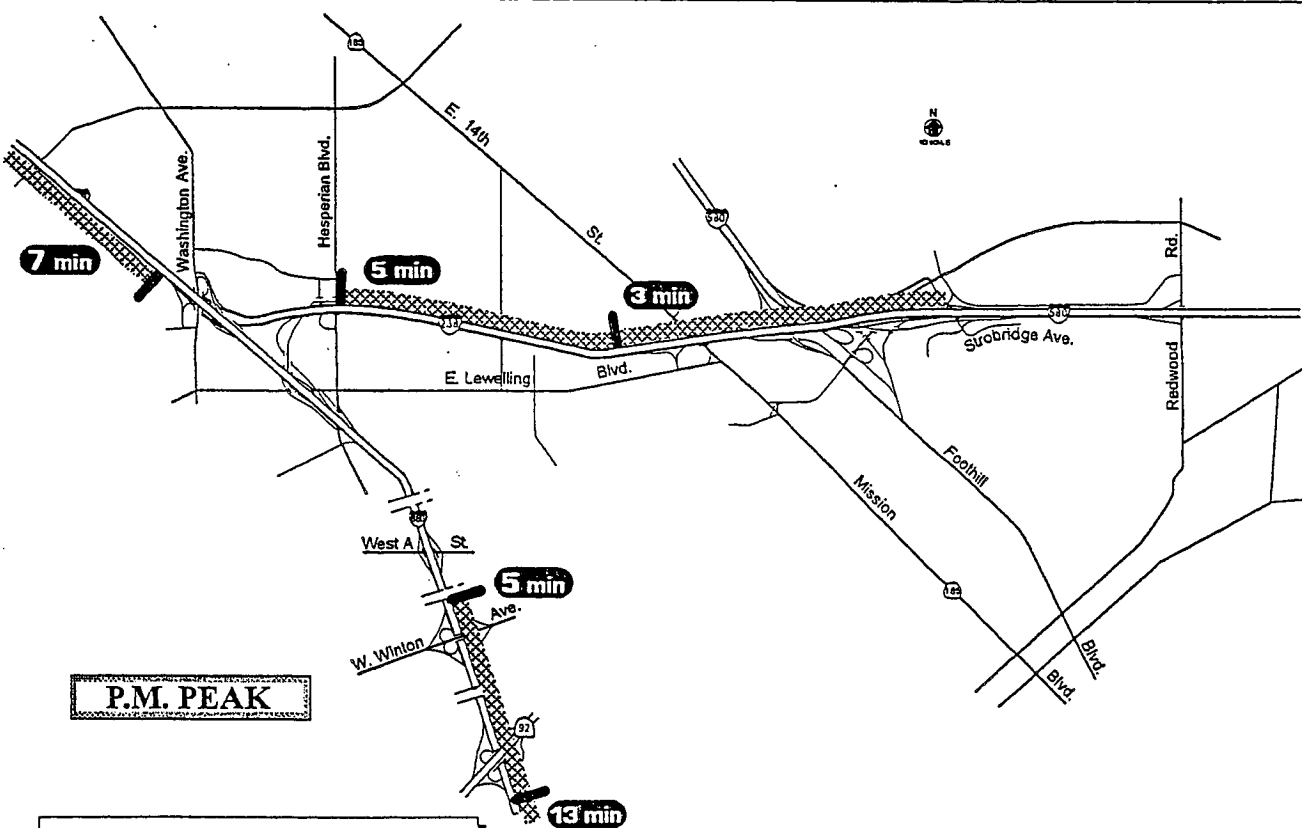
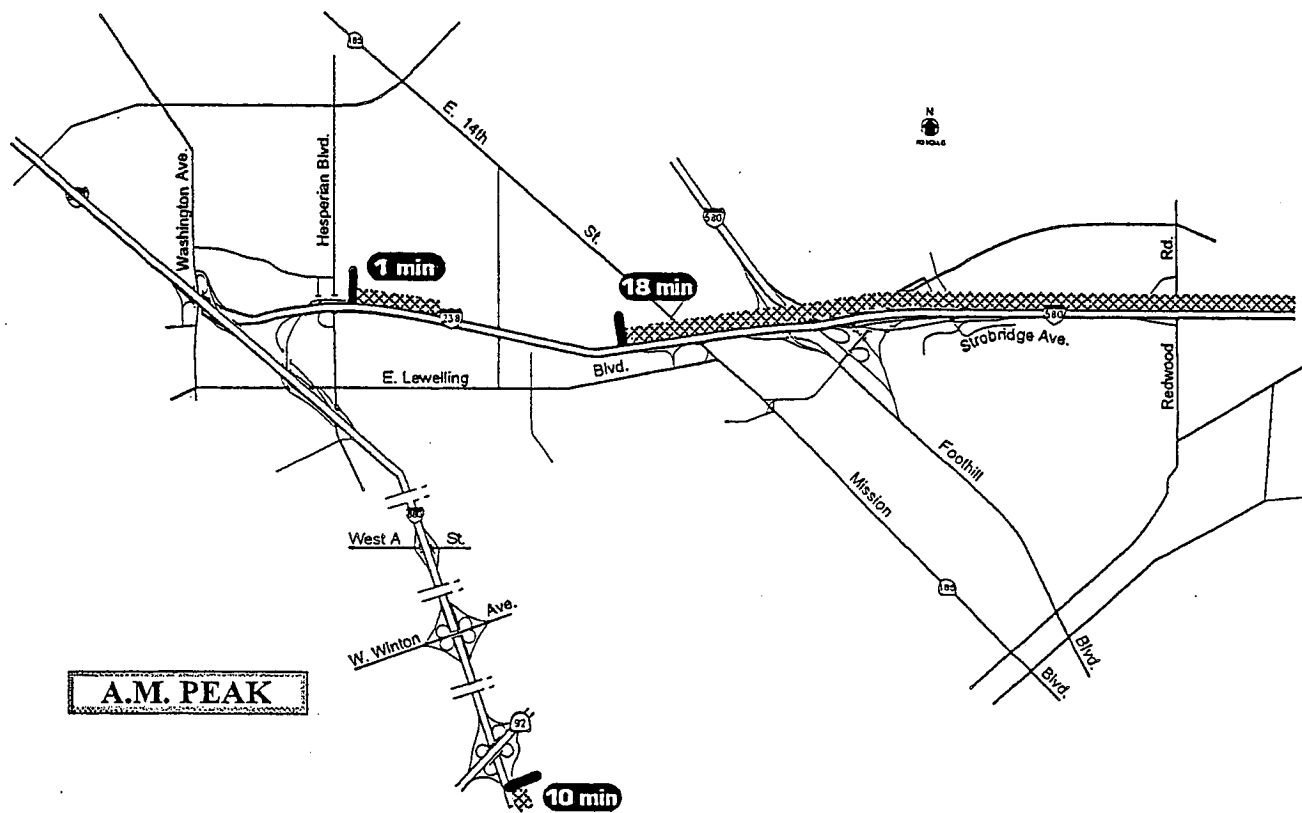
Projected bottlenecks and queues identified for the 2005 No Project conditions are shown in Figure 11.

A.M. Peak. Bottlenecks are projected on northbound I-238 in the A.M. peak hour in two locations, at the on-ramp from East 14th Street and at the single-lane connector ramp to southbound I-880. The maximum combined delay would be about 19 minutes. Although queues on I-238 are projected to increase compared to existing conditions, the traffic volumes and queues on the connector ramp to southbound I-880 are not projected to increase compared to existing conditions. This is due to projected increases in congestion on southbound I-880 and the planned completion of the Route 238 Hayward Bypass, both of which would tend to divert traffic away from the connector movement. No bottlenecks or queues are projected in the A.M. peak hour on southbound I-238. No queues are projected on southbound I-880, due to the planned improvements at the SR 92 interchange.



LEGEND
9,100(8,260) AM(PM) Peak Hour Volumes

Interstate 238 Connector PSR	Figure
Year 2025 Project Traffic Demand	10



Legend

- Bottleneck Location
- Calculated Peak Hour Queue
- Calculated Peak Hour Delay

Interstate 238 Connector PSR

**Queue Locations
2005 No Project**

Figure

11

P.M. Peak. Bottlenecks are projected on northbound I-238 in two locations, with a maximum combined delay of about eight minutes. Queues are projected to be reduced on southbound I-880 compared to existing conditions, due to a greater percentage of high-occupancy vehicles which would reduce volume in the constrained mixed-flow lanes. A bottleneck is projected on northbound I-880 approaching A Street, extending back nearly three miles and causing maximum delays of over five minutes. This bottleneck would constrain traffic volumes on the connector ramp to southbound I-238 to 80 percent of the demand volumes. The constrained connector ramp volumes would help to prevent queues on southbound I-238. The increased merge capacity provided by the planned interim improvement project on southbound I-238 would also help to reduce queuing in this location.

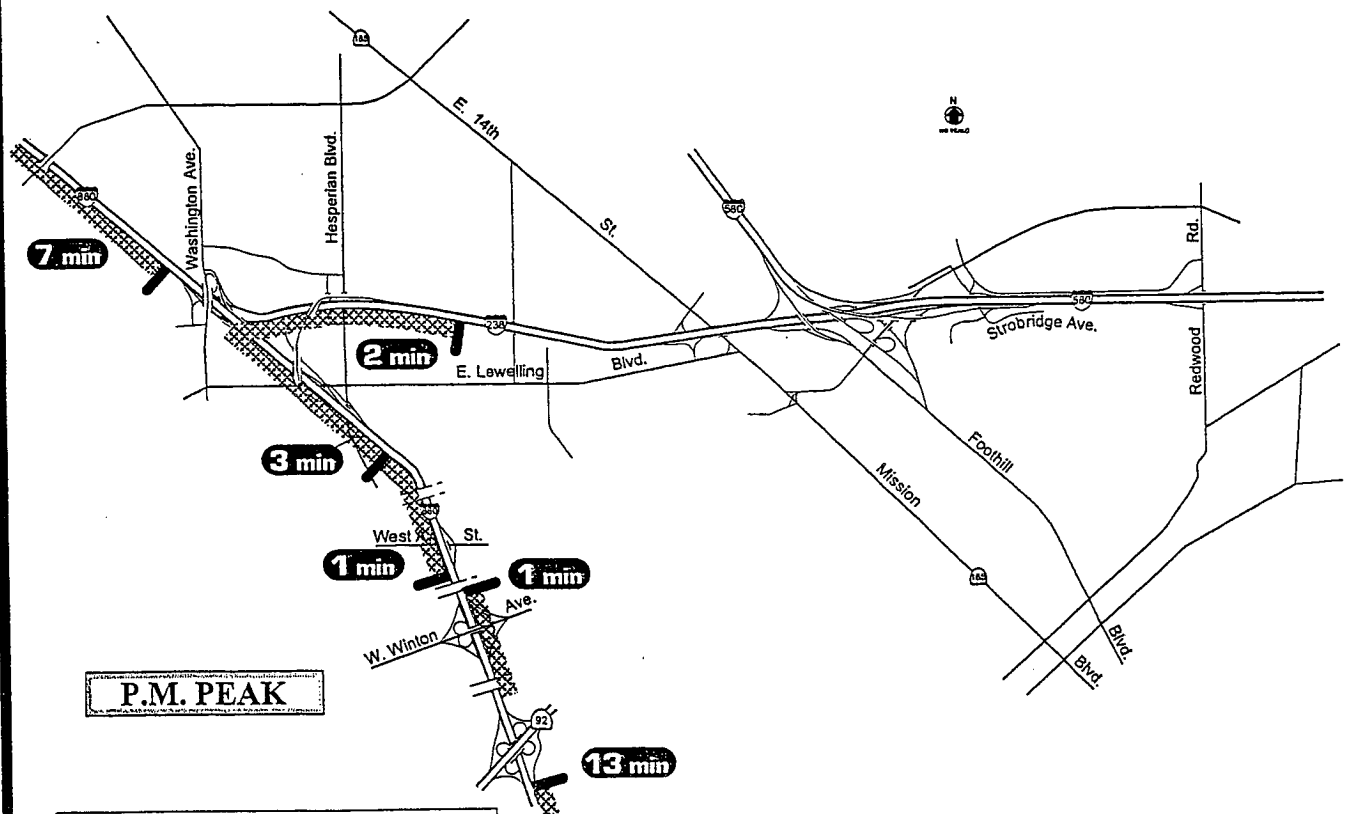
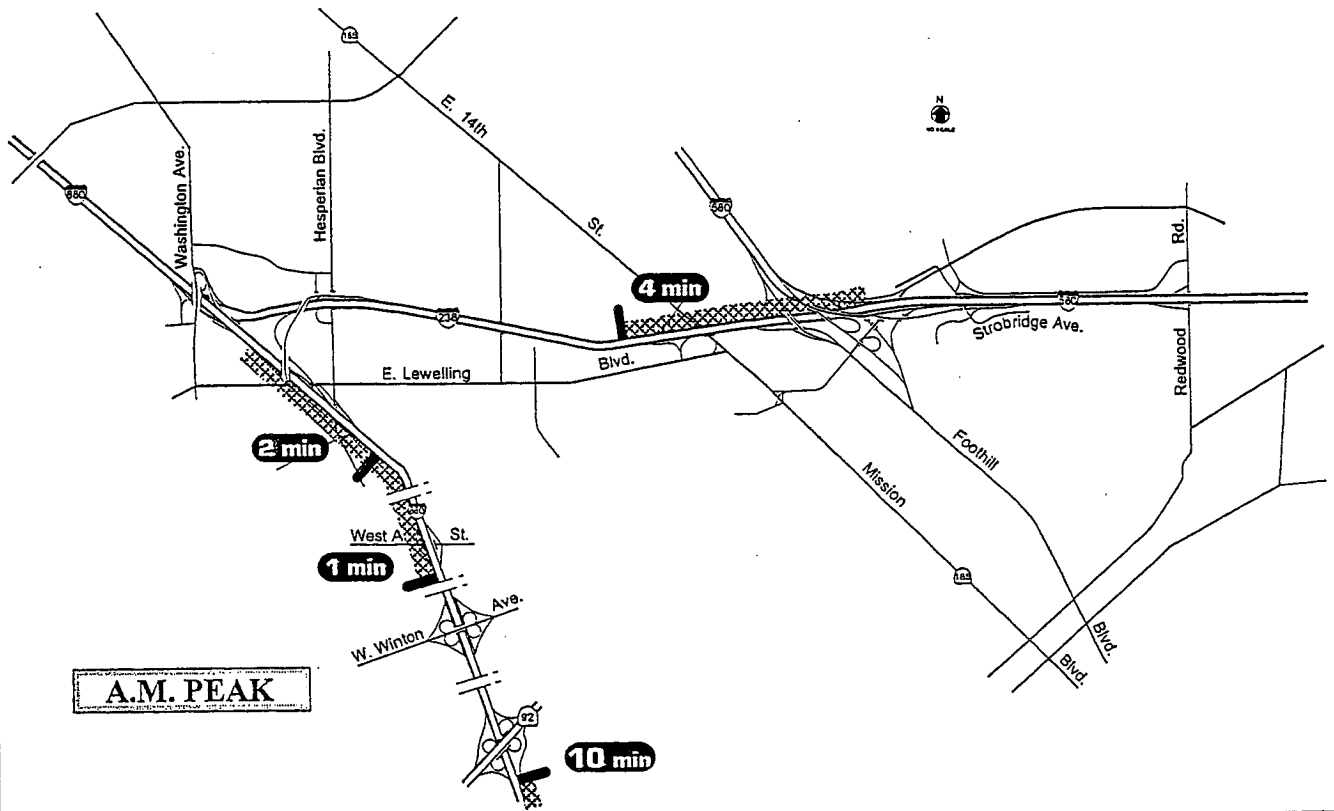
2005 Project

Projected bottlenecks and queues identified for the 2005 Project conditions are shown in Figure 12.




A.M. Peak. A queue is projected on northbound I-238 at the East 14th Street on-ramp. The maximum delay would be 22 percent of the delays under the No Project condition, despite a traffic volume 50 percent higher. The Project would allow northbound I-238 to deliver nearly 1000 additional vehicles to southbound I-880. The additional demand would cause queues on I-880 in two locations, at the lane drop after the I-238 ramp and at the A Street on-ramp, with maximum delays of three minutes. No bottlenecks or queues are projected in the A.M. peak hour on southbound I-238.

P.M. Peak. No bottlenecks or queues are projected on northbound I-238. A bottleneck with maximum delays of two minutes is projected on southbound I-238 at the point where the road would narrow from four to three lanes. A bottleneck is projected on northbound I-880 approaching A Street, extending back about one-half mile and causing maximum delays of one minute.

Project Impacts. The Project would increase A.M. peak hour throughput from northbound I-238 to southbound I-880 by 50 percent and to northbound I-880 by nearly 50 percent. Delays on southbound I-880 south of I-238 would be increased by about three minutes. These delays on the I-880 mainline could be reduced through use of ramp metering on the on-ramp from northbound I-238. The Project would increase P.M. peak hour throughput on southbound I-238 by 50 percent, with no projected increases in delay on I-880.



Legend

-  Bottleneck Location
-  Calculated Peak Hour Queue
-  Calculated Peak Hour Delay

Interstate 238 Connector PSR

**Queue Locations
2005 Project**

Figure

12

2025 No Project

Projected bottlenecks and queues identified for the 2025 No Project conditions are shown in Figure 13.

A.M. Peak. Bottlenecks on northbound I-238 at the East 14th Street ramps would result in maximum delays of about 17 minutes. No bottlenecks or queues are projected in the A.M. peak hour on southbound I-238. No queues are projected on southbound I-880, due to the planned improvements at the SR 92 interchange.

P.M. Peak. Bottlenecks are projected at two locations on northbound I-238, resulting in maximum delays of about nine minutes. Two bottlenecks are projected on northbound I-880, one approaching SR 92 and one approaching A Street. A bottleneck would occur on southbound I-238 past the 14th Street off-ramp resulting in maximum delays of 15 minutes.

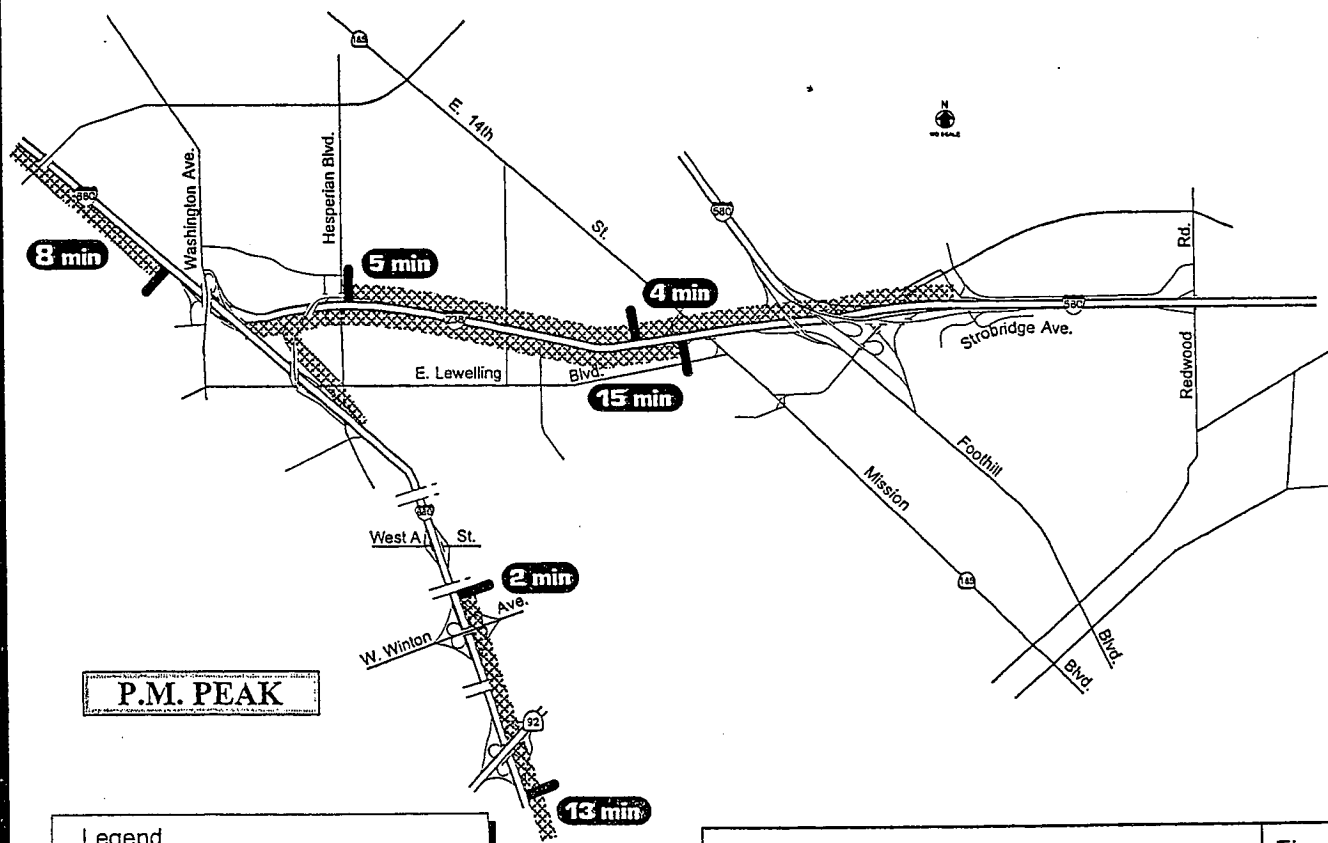
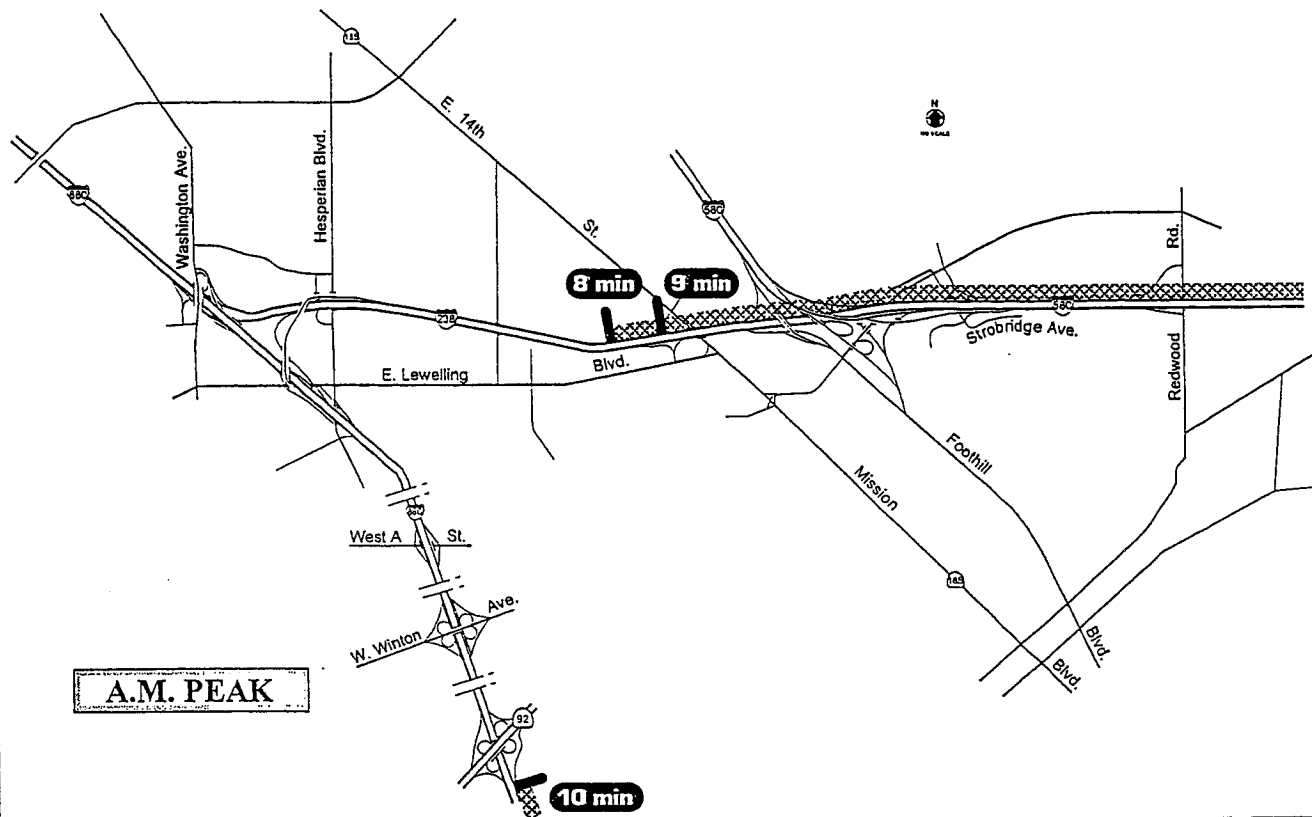
2025 Project

Projected bottlenecks and queues identified for the 2025 Project conditions are shown in Figure 14.




A.M. Peak. The Project would allow northbound I-238 to deliver 1,070 additional vehicles to southbound I-880. Maximum delays on I-238 would be reduced to seven minutes. The additional demand on southbound I-880 would cause queues in two locations with maximum total delays of two minutes. No bottlenecks or queues are projected in the A.M. peak hour on southbound I-238.

P.M. Peak. No bottlenecks or queues are projected on northbound I-238 or southbound I-880. A bottleneck is projected on northbound I-880 approaching A Street, causing maximum delays of three minutes. A bottleneck with maximum delays of six minutes is projected on southbound I-238 at the point where the road would narrow from four to three lanes.

Project Impacts. The Project would increase throughput on northbound I-238 by 50 percent during the A.M. peak hour, and would reduce delays to less than half of the No Project condition. Delays on southbound I-880 would increase by two minutes. These delays on the I-880 mainline could be reduced through use of ramp metering on the on-ramp from northbound I-238. The Project would increase P.M. peak hour throughput on southbound I-238 by 50 percent, and would decrease maximum delays by about 60 percent.



Legend

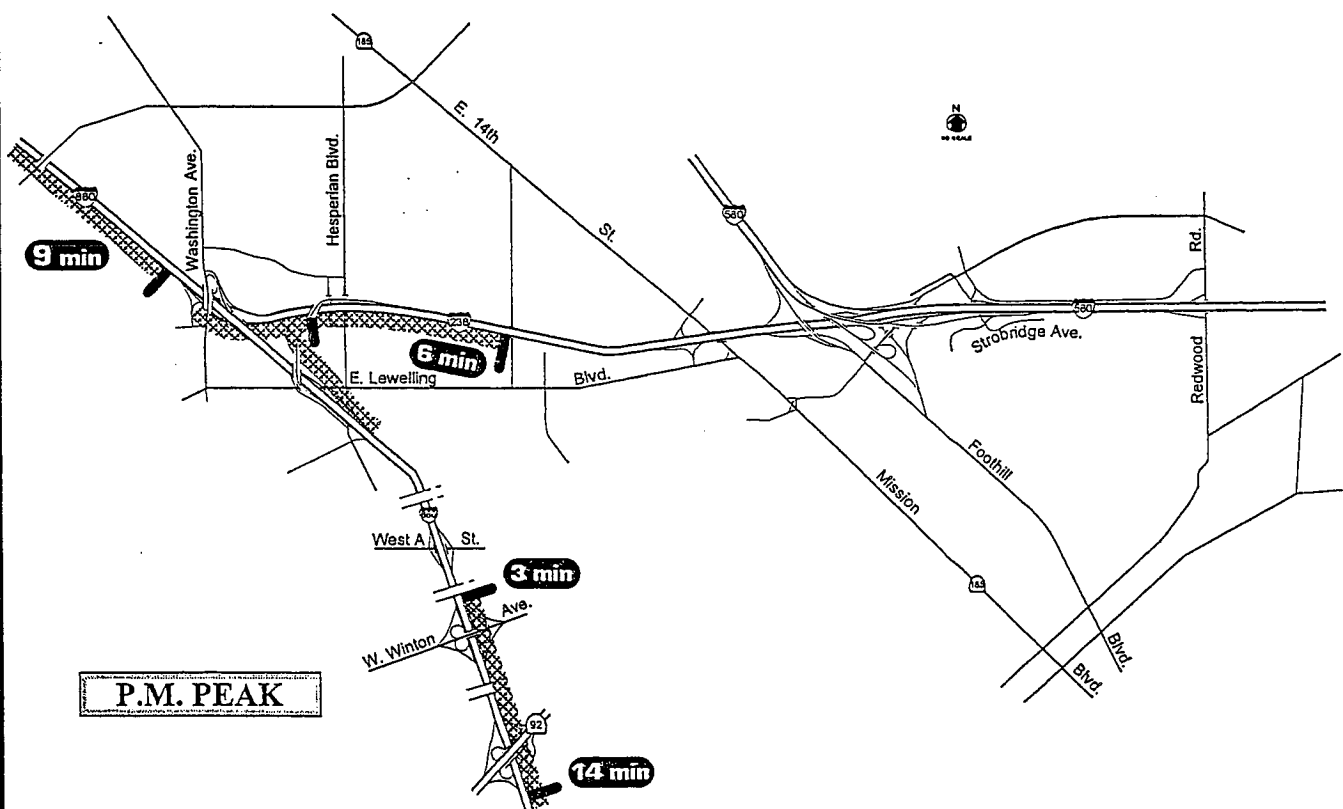
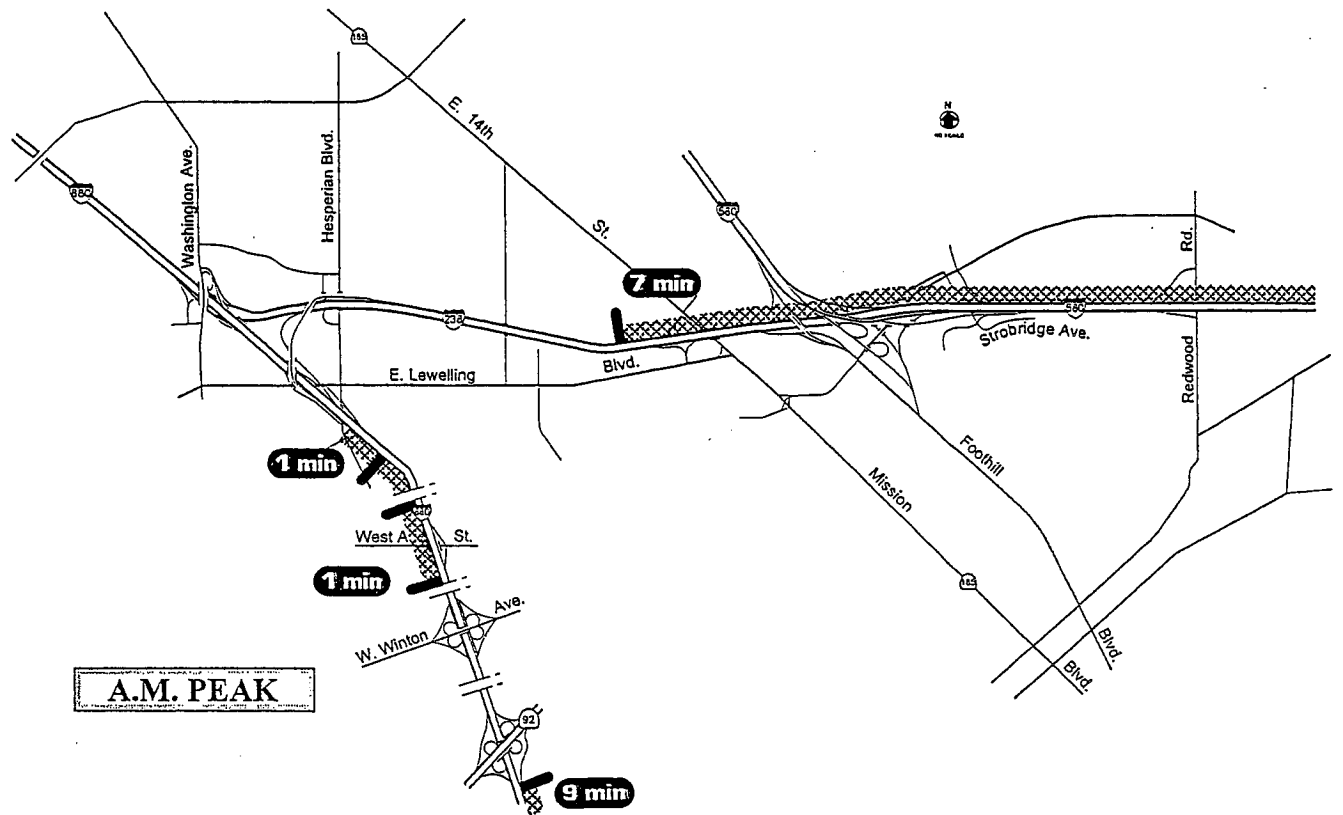
-  Bottleneck Location
-  Calculated Peak Hour Queue
-  Calculated Peak Hour Delay

Interstate 238 Connector PSR

**Queue Locations
2025 No Project**

Figure

13



Legend

- Bottleneck Location
- ▨ Calculated Peak Hour Queue
- 14 min Calculated Peak Hour Delay

Interstate 238 Connector PSR

**Queue Locations
2025 Project**

Figure

14

Level of Service Analysis

The peak hour constrained volumes on critical segments of the I-238 and I-880 freeways were compared to capacities using the procedures described in Chapter 3 of the 1994 *Highway Capacity Manual* (HCM). If the constraint analysis indicated that the freeway segment would be in queued conditions, the level of service was assumed to be LOS F regardless of the projected traffic volume or HCM analysis results (Table 2).

Table 2
Freeway Level of Service

Freeway Segment	2005 No Project		2005 Project		2025 No Project		2025 Project	
	AM	PM	AM	PM	AM	PM	AM	PM
I-238 (East 14th St. - Hesperian Blvd.)								
Northbound	F	F	F	D	F	F	F	D
Southbound	C	D	C	F	C	F	D	F
I-880 (Winton Ave. - A St.)								
Northbound	D	D	E	E	E	E	F	F
Southbound	E	E	F	F	E	E	F	F

The level of service analysis indicates that the I-238 project would mitigate congested LOS F conditions on northbound I-238 in the P.M. peak but not in the A.M. peak. The project would result in poorer level of service on southbound I-238, although the southbound segment would carry 50 percent more traffic with the project. The additional throughput on I-238 would result in poorer levels of service on I-880. Despite these level of service results, the project would have an overall benefit in terms of travel time and delay, as described in Section 4.

INTERSECTION OPERATIONS

Future intersection operations were evaluated using the same 1994 HCM Operations methodology as the existing conditions analysis (Table 3). Future intersection turn volumes were estimated using the "Furness" procedure to factor existing turn counts to match projected peak hour link approach and departure volumes at each intersection. For purposes of this comparative analysis, existing lane geometrics and signal phasings were assumed at each intersection.

2005 Intersection Operations

With 2005 No Project conditions, one intersection is projected to operate at LOS F in the A.M. peak hour and five intersections are projected to operate at LOS E or F during the P.M. peak hour.

Table 3
Future Intersection Operations

Intersection	2005 No Project		2005 Project		2025 No Project		2025 Project	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
A.M. Peak Hour								
Washington Ave. & I-880 NB Ramps	B	13	B	13	B	14	B	15
Washington Ave. & Beatrice St.	B	12	B	13	C	15	B	14
Hesperian Blvd. & Lewelling Blvd.	D	37	D	29	D	38	D	32
Hesperian Blvd. & I-238 SB On	B	8	B	8	B	11	B	10
I-238 NB Off & Springlake Dr.	B	7	B	6	B	9	B	8
Meekland Ave. & Lewelling Blvd.	B	13	B	13	C	15	C	17
I-238 SB Ramps & Lewelling Blvd.	D	27	C	23	D	25	B	12
E. 14 th /Mission & Lewelling Blvd.	C	16	C	15	B	14	B	14
E. 14 th /Mission & I-238 NB Ramps	C	17	C	19	C	16	C	17
E. 14 th /Mission & Mattox Rd.	C	19	C	19	D	36	C	24
I-238/I-580 Off & Castro Vly/Mattox	D	25	C	22	D	31	D	31
Foothill/I-238 NB & Castro Vly Blvd.	A	1	A	1	A	1	A	1
Norbridge Ave. & Castro Valley Blvd.	F	>60	F	>60	F	>60	F	>60
Redwood Rd. & I-580 WB On	A	4	A	4	B	8	B	5
Redwood Rd. & I-580 EB Off	B	9	B	9	C	17	B	9
P.M. Peak Hour								
Washington Ave. & I-880 NB Ramps	B	14	B	13	C	24	C	16
Washington Ave. & Beatrice St.	B	13	B	13	B	13	B	13
Hesperian Blvd. & Lewelling Blvd.	E	42	E	44	E	49	E	53
Hesperian Blvd. & I-238 SB On	B	11	B	10	B	9	B	10
I-238 NB Off & Springlake Dr.	B	8	B	8	B	8	B	7
Meekland Ave. & Lewelling Blvd.	C	17	B	15	C	15	C	16
I-238 SB Ramps & Lewelling Blvd.	E	60	D	34	D	27	B	7
E. 14 th /Mission & Lewelling Blvd.	C	16	B	13	C	17	C	20
E. 14 th /Mission & I-238 NB Ramps	E	44	E	49	E	59	C	18
E. 14 th /Mission & Mattox Rd.	F	>60	C	22	F	>60	F	>60
I-238/I-580 Off & Castro Vly/Mattox	D	34	C	24	F	>60	F	>60
Foothill/I-238 NB & Castro Vly Blvd.	A	1	A	1	A	1	A	1
Norbridge Ave. & Castro Valley Blvd.	E	56	E	59	F	>60	F	>60
Redwood Rd. & I-580 WB On	A	4	A	4	A	4	A	4
Redwood Rd. & I-580 EB Off	B	14	B	13	C	18	B	15

Notes:

LOS = Level of service

Delay = Average delay for all vehicles passing through intersection, in seconds

The I-238 Widening Project would reduce traffic volumes and delays at many of these intersections, resulting in no LOS F conditions and only three intersections operating at LOS E during the P.M. peak hour. The Project would have little effect on the intersection of Norbridge Road and Castro Valley Boulevard, which would operate at LOS F in the A.M. peak hour without mitigation. The Project would appear to have the most beneficial impact on parallel streets to the south of I-238, such as Lewelling Boulevard and Mattox Road.

2025 Intersection Operations

With 2025 No Project conditions, one intersection is projected to operate at LOS F in the A.M. peak hour and five intersections are projected to operate at LOS E or F during the P.M. peak hour. These results are similar to the 2005 peak hour analysis.

The I-238 Widening Project would only improve the LOS to D or better at one of the deficient intersections. Traffic volumes and delays would be reduced somewhat at the three intersections projected to operate at LOS F during the P.M. peak hour, but not enough to eliminate LOS F conditions. Additional mitigation would be required to provide acceptable traffic operations at these intersections, although this mitigation would not be required due to the I-238 project.

SECTION 4

TRAFFIC OPERATIONS EVALUATION

The technical evaluation of future traffic operations presented in Section 3 is used to evaluate the following traffic operations issues associated with the SR 238 project:

- Interstate 880 impacts
- Goods movement
- Surface street operations
- Overall project benefits

INTERSTATE 880 IMPACTS

The I-238 project would provide traffic operations benefits for vehicles on I-238, but could introduce additional impacts on I-880.

Traffic Volumes

The I-238 project would increase 2005 traffic demand on southbound I-880 south of I-238 by up to six percent in the A.M. peak hour and three percent in the P.M. peak hour. Traffic demand in 2025 would be increased by up to eight percent in the A.M. peak hour and three percent in the P.M. peak hour.

The I-238 project would increase 2005 or 2025 northbound traffic on I-880 by about three percent in the A.M. peak hour compared to No Project conditions. Increases in northbound I-880 traffic of up to seven percent are projected for the P.M. peak hour.

Comparison of Delays

During the 2005 A.M. peak hour, the I-238 project would increase delays on southbound I-880 by about four minutes, while reducing delays on northbound I-238 from 18 to four minutes. In terms of vehicle-hours of delay, the project would create an additional 720 vehicle-hours of delay on southbound I-880, and would reduce the vehicle-hours of delay on northbound I-238 by 1,590 vehicle-hours.

For the 2025 A.M. peak hour, the project would increase delays on southbound I-880 by about two minutes (350 vehicle-hours), and would decrease delays on northbound I-238 by about 10 minutes (1,190 vehicle-hours).

During the 2025 P.M. peak hour, the project would increase delays on northbound I-880 south of I-238 by about one to two minutes.

It should be noted that these delay times are based on peak hour traffic calculations only, and should only be used for comparison purposes between scenarios. More accurate delay and queuing calculations would require consideration of individual time periods (such as 15 minutes) within the entire peak period.

Use of Ramp Metering

The potential impacts on southbound I-880 could be reduced by implementing ramp metering on the ramp from northbound I-238 to southbound I-880. The approximate capacity of southbound I-880 is 9,500 vehicles per hour (four mixed-flow lanes at 2,000 per lane plus one HOV lane at 1,500). Future queuing could be reduced by restricting flow so that the maximum hourly demand on southbound I-880 is 9,500 vehicles or less.

In the 2005 A.M. peak hour, the maximum demand on southbound I-880 would be 10,300 south of A Street. To reduce the volume to 9,500, it would be necessary to reduce the flow on the I-238 ramp from 3,490 to 2,690 vehicles per hour. The remaining flow would require a two-lane ramp, as proposed by the I-238 project.

In the 2025 A.M. peak hour, the maximum demand on southbound I-880 would be 10,630 south of A Street. To reduce the volume to 9,500, it would be necessary to reduce the flow on the I-238 ramp from 3,590 to 2,460 vehicles per hour. The remaining flow would require a two-lane ramp.

On northbound I-880, the demand would be primarily constrained by the freeway segment south of SR 92, which only provides capacity for approximately 7,500 vehicles per hour (three mixed-flow lanes plus one HOV lane). Additional reductions in flow could be achieved by implementing ramp metering on the proposed flyover ramp from eastbound SR 92.

Ramp metering rates would have to be carefully balanced to ensure that queues from metered ramps would not impede traffic flow on I-238 or SR 92 and negate the travel time benefits on I-880.

GOODS MOVEMENT

A primary goal of the I-238 project would be to improve goods movement between the Central Valley and important East Bay destinations such as the Port of Oakland.

Truck Volumes

Assuming similar truck percentages as existing conditions (see Figure 3), there would be about 1,000 trucks on northbound I-238 during the 2025 A.M. peak hour. Of these 1,000 trucks, 600 would be destined for northbound I-880 and 400 would connect to southbound I-880. There would be about 700 trucks on southbound I-238, with 400 coming from southbound I-880 and 300 from northbound I-880.

In the 2025 P.M. peak hour, there would be about 600 trucks on southbound I-238, with 300 coming from southbound I-880 and 300 from northbound I-880.

Delay Impacts

The Project would significantly reduce (but would not eliminate) delays for truck movements on northbound I-238. Trucks continuing south on I-880 may encounter additional delays on I-880 south of I-238, but there would still be a net decrease in overall delays.

Truck Bypass Lanes

The 2025 Project includes truck bypass lanes on I-238. The northbound bypass lanes would start from westbound I-580 before the off-ramp to I-238, and would join northbound I-238 west of the East 14th/Mission off-ramp. The on-ramp from East 14th Street would be eliminated. The southbound bypass lanes would start from southbound I-238 past the Lewelling/Mission off-ramp (the on-ramp would be eliminated), and would join eastbound I-580 east of Strobbridge Avenue.

The truck bypass lanes would carry 600 to 700 peak hour vehicles. These vehicles would be able to travel without congestion on the bypass lanes. In the northbound direction, the bypass lanes would allow trucks to avoid approximately 1.5 miles of congested freeway during the A.M. peak. The estimated time savings would be five minutes. There would not be any congestion projected on this northbound segment during the P.M. peak, so the northbound bypass lane would have minimal benefits outside the A.M. peak period. The bypass lanes would not avoid the most congested locations on I-238 in the southbound direction, so travel time savings would be insignificant.

The proposed truck bypass lanes would have several impacts on the operations of I-238. Area accessibility would be reduced by eliminating the on-ramps from East 14th Street, although eliminating these ramps would also reduce some existing weaving conflicts. The northbound truck bypass lane would introduce a weaving issue on northbound I-238. Since 60 percent of the trucks are destined for northbound I-880, the majority of trucks (about 600 in the A.M. peak hour) would need to cross over at least one lane to the left within a distance of approximately one-half mile.

In summary, the proposed northbound truck bypass lane would provide travel time savings during the A.M. peak period, but may introduce additional operational issues. The proposed southbound truck bypass lane would not significantly reduce goods movement travel times.

SURFACE STREET IMPACTS

The I-238 project would allow additional traffic to travel on I-238, due to the provision of additional capacity on a constrained corridor. These vehicles would be diverted from other routes, primarily local surface streets. Traffic volumes on study area streets were compared (Table 4).

Table 4
Comparison of AM Peak Hour Street Volumes

Street Segment	2005 No Project	2005 Project	2025 No Project	2025 Project
Marina Blvd., E. of I-880	1,970	2,060 (+5%)	2,200	2,270 (+3%)
Fairmont Dr., E. of E. 14th	1,340	900 (-33%)	1,430	1,020 (-29%)
164th Ave., E. of E. 14th	410	380 (-7%)	460	340 (-26%)
Lewelling Blvd., E. of Hesperian	1,690	1,650 (-2%)	1,860	1,970 (+6%)
Lewelling Blvd., W. of Mission	1,470	1,330 (-10%)	1,410	1,280 (-9%)
Castro Valley Blvd., E. of Foothill	2,460	2,130 (-13%)	3,130	3,060 (-2%)
A St., E. of I-880	2,540	2,340 (-8%)	3,520	3,340 (-5%)
A St., W. of Foothill	1,670	1,760 (+5%)	2,000	1,860 (-7%)
Winton Ave., E. of I-880	3,150	2,930 (-7%)	3,490	3,330 (-5%)
Jackson St., E. of I-880	6,230	6,120 (-2%)	6,490	6,180 (-5%)

The I-238 project would reduce traffic volumes on many parallel streets. Of particular significance are projected reductions of 9 to 10 percent on Lewelling Boulevard, 5 to 7 percent on Winton Avenue and 2 to 5 percent on Jackson Street. In some locations (such as Marina Boulevard), the Project could allow additional throughput to an I-880 interchange, causing volume increases which may compensate for any traffic diversion benefits.

OVERALL PROJECT BENEFITS

The primary benefits of the I-238 Widening Project would be:

- Reduction in overall vehicle-hours of delay in the area, despite potential impacts on I-880.
- Reduction of peak hour queuing, which will help to improve safety and reduce potential impacts on westbound I-580.
- Reductions in traffic volumes on parallel surface streets, with some net improvements in operations at street intersections.

Important traffic operations issues to be resolved include:

- Potential implementation of ramp metering to improve I-880 operations.
- Effectiveness of proposed truck bypass lanes for 2025 Project, particularly in the southbound direction.

APPENDIX A

FORECAST VOLUME ADJUSTMENTS

APPENDIX B

FREEWAY CONSTRAINT ANALYSIS

APPENDIX C

FREEWAY AND RAMP CAPACITY ANALYSIS

APPENDIX D

INTERSECTION CALCULATIONS